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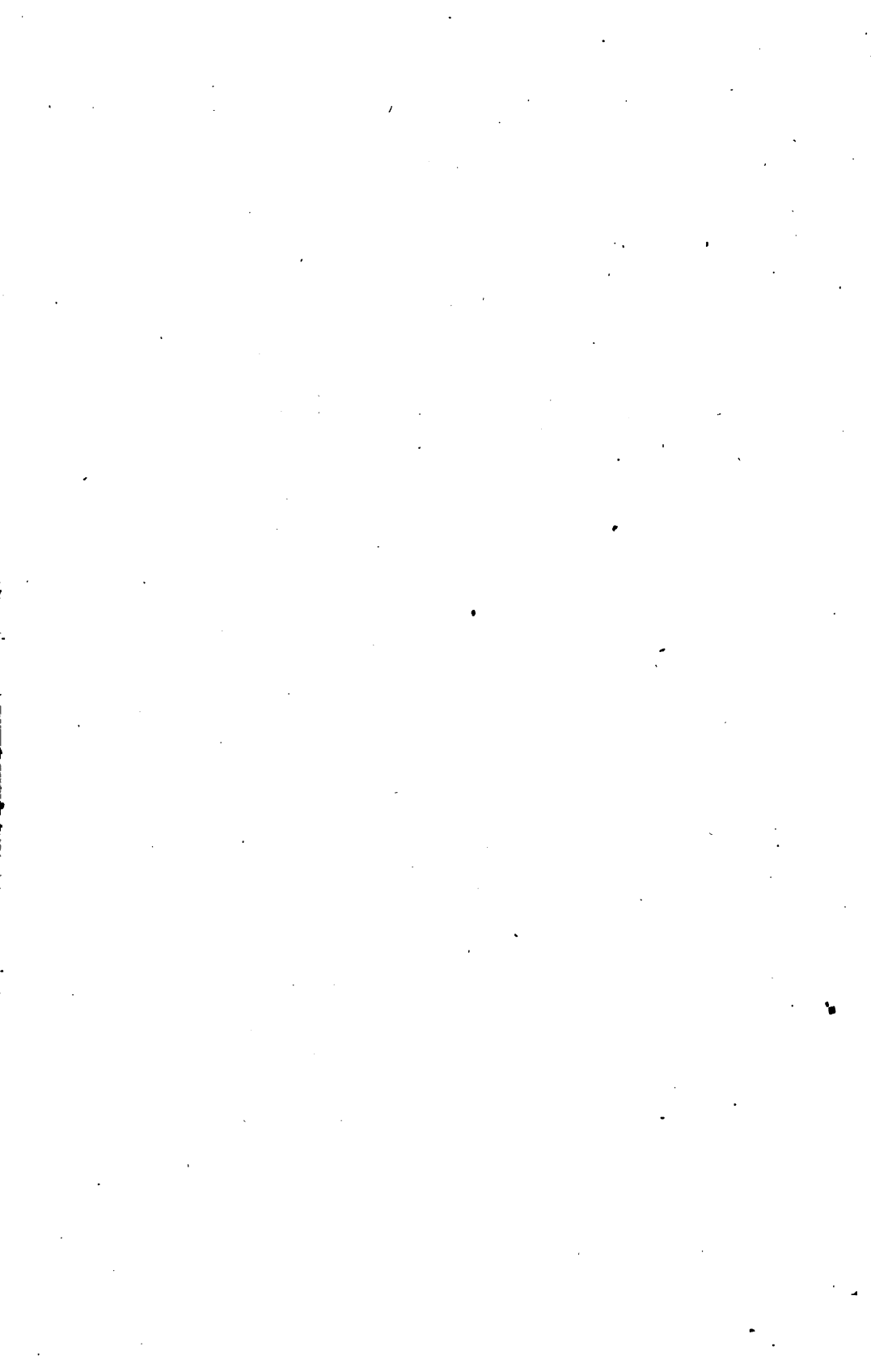
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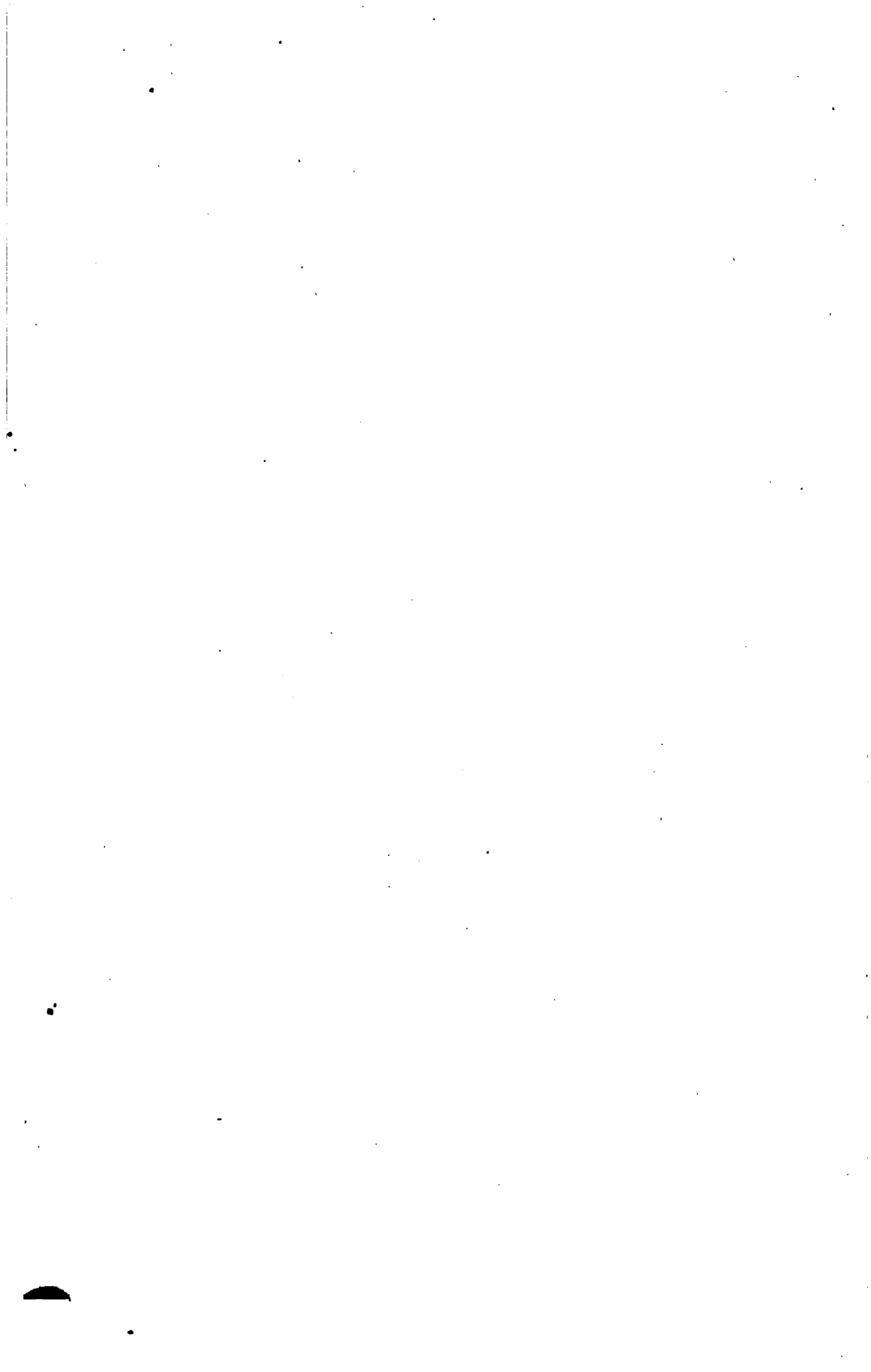
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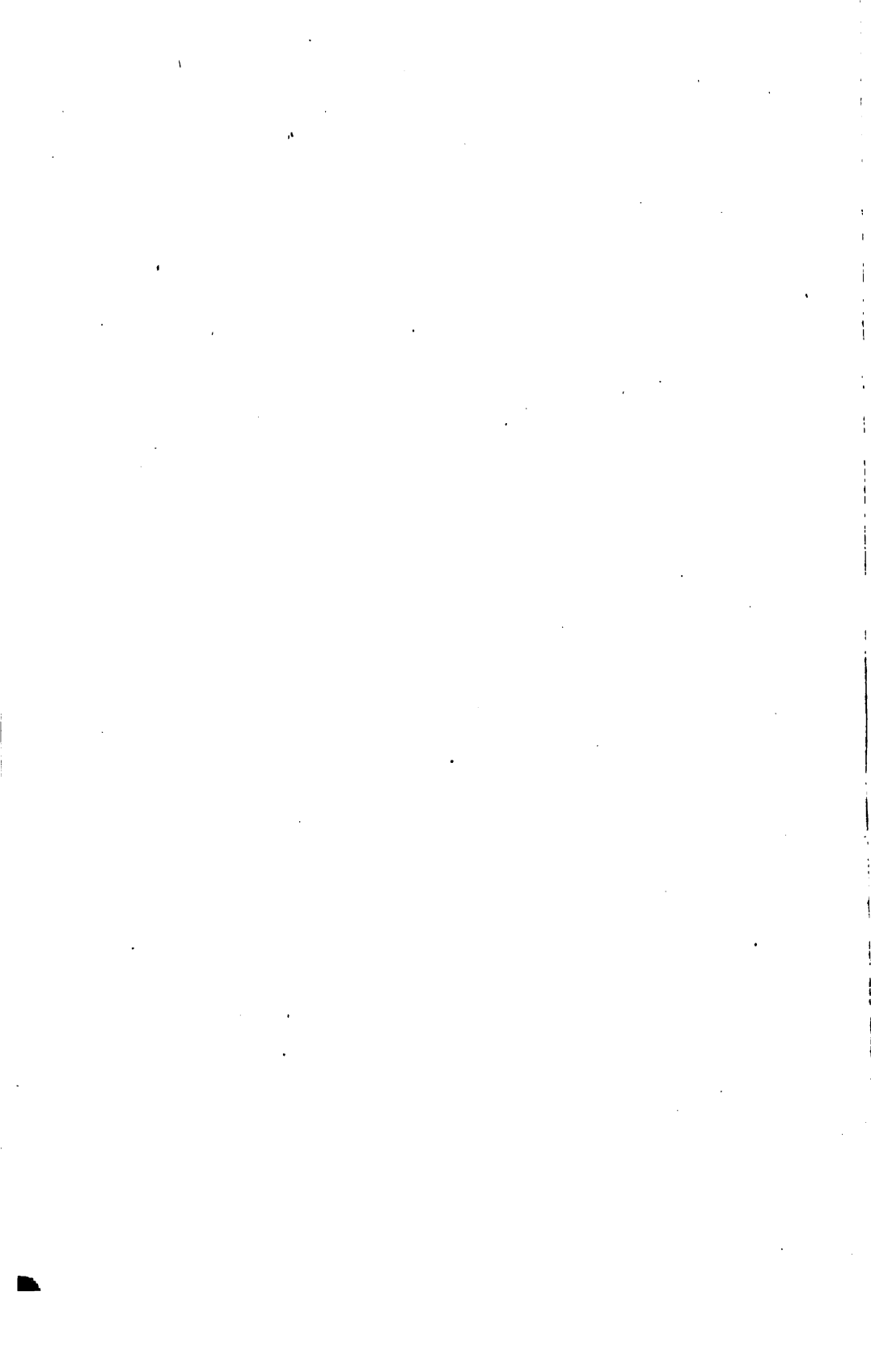
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FIFTH BIENNIAL REPORT

OF THE

STATE BOARD OF HORTICULTURE

OF THE

STATE OF CALIFORNIA,

FOR 1895-96.



SACRAMENTO:

A. J. JOHNSTON, : : : SUPERINTENDENT STATE PRINTING.

1896.

CALIFORNIA

STATE BOARD OF HORTICULTURE.

ELLWOOD COOPER, President	Santa Barbara.
Commissioner for the Los Angeles District.	
MARK L. McDONALD, Vice-President	Santa Rosa.
Commissioner for the Sonoma District.	
FRED C. MILES, Treasurer.....	Penryn.
Commissioner for the El Dorado District.	
RUSS D. STEPHENS.....	Sacramento.
Commissioner for the State at Large.	
FRANK A. KIMBALL.....	National City.
Commissioner for the State at Large.	
SOL RUNYON.....	Courtland.
Commissioner for the Sacramento District.	
BEN M. MADDOX.....	Visalia.
Commissioner for the San Joaquin District.	
A. BLOCK.....	Santa Clara.
Commissioner for the San Francisco District.	
FRANK H. BUCK.....	Vacaville.
Commissioner for the Napa District.	

B. M. LELONG, Secretary	Ex officio Chief Horticultural Officer.
ALEXANDER CRAW.....	Quarantine Officer and Entomologist.
ELLA F. HALLAHAN.....	Clerk.

OFFICES:

STATE CAPITOL SACRAMENTO, CAL.

Branch Office:

CLAY-STREET DOCK, SAN FRANCISCO.

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1894/96

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ERRATA.

On page 25, for "*canotrachelus*," read "*conotrachelus*."

On page 25, for "*C. fletcherell*," read "*C. fletcherella*."

On page 60, for "Pear blister mite," read "Pear leaf blister mite."

On page 60, referring to the grade of cyanide of potassium, read "C. P. 98%," instead of "60%."

REPORT.

OFFICE OF STATE BOARD OF HORTICULTURE, }
STATE CAPITOL, SACRAMENTO, CAL., October 1, 1896. }

To his Excellency JAMES H. BUDD, Governor, and the honorable the Senate and Assembly of California:

In accordance with law, we have the honor to submit herewith our fifth biennial report for the years 1895-96.

ELLWOOD COOPER, President,
MARK L. McDONALD,
FRED C. MILES,
R. D. STEPHENS,
FRANK A. KIMBALL,
SOL. RUNYON,
BEN M. MADDOX,
A. BLOCK,
FRANK H. BUCK,

Commissioners.

Attest:

B. M. LELONG,

Secretary, and Chief Horticultural Officer.

I.

STATE LAWS RELATING TO HORTICULTURE.

AN ACT

TO CREATE AND ESTABLISH A STATE BOARD OF HORTICULTURE.

(Approved March 13, 1883; amended by an Act approved March 8, 1889.)

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. There shall be a State Board of Horticulture, consisting of nine members, who shall be appointed by the Governor; two from the State at large, and one from each of the seven horticultural districts, which are hereby constituted as follows:

First—The Sonoma District, which shall include the counties of Sonoma, Marin, Lake, Mendocino, Humboldt, Del Norte, Trinity, and Siskiyou.

Second—The Napa District, which shall include the counties of Napa, Solano, and Contra Costa.

Third—The San Francisco District, which shall include the City and County of San Francisco, and the counties of San Mateo, Alameda, Santa Clara, Santa Cruz, San Benito, and Monterey.

Fourth—The Los Angeles District, which shall include the counties of Los Angeles, Ventura, Santa Barbara, San Luis Obispo, San Bernardino, and San Diego.

Fifth—The Sacramento District, which shall include the counties of Sacramento, Yolo, Sutter, Colusa, Butte, Tehama, and Shasta.

NOTE.—The amendments to the original Act appear in brackets.

Sixth—The San Joaquin District, which shall include the counties of San Joaquin, Stanislaus, Merced, Fresno, Tulare, and Kern.

Seventh—The El Dorado District, which shall include the counties of El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Placer, Nevada, Yuba, Sierra, Plumas, Lassen, Modoc, Alpine, Mono, and Inyo.

SEC. 2. The members appointed from each district shall be residents of the district from which they are appointed, and shall be specially qualified by practical experience and study in connection with the industries dependent upon horticulture. They shall each hold office for the term of four years, except that of the nine first appointed, four, to be determined by lot, shall retire at the end of two years, when their successors shall be appointed by the Governor.

SEC. 3. [The Board shall biennially elect a President, a Vice-President, a Chairman of the Finance Committee, and appoint from without their own number, a Secretary, who shall be ex officio Horticultural Officer, and elect of their own number a Treasurer, who shall give a bond to the State, with sureties approved by the Board, in the sum of ten thousand dollars, for the faithful discharge of his duties.]

SEC. 4. The Board may receive, manage, use, and hold donations and bequests for promoting the objects of its formation. It shall meet semi-annually, and as much oftener and at such places as it may deem expedient, to consult and adopt such measures as may best promote the horticultural industries of the State. It may, but without expense to the State, select and appoint competent and qualified persons to lecture in each of the horticultural districts named in section one of this Act, for the purpose of illustrating practical horticultural topics, and imparting instruction in the methods of culture, pruning, fertilizing, and also in the best methods of treating the diseases of fruit and fruit trees, cleansing orchards, and exterminating insect pests. The office of the Board shall be kept open to the public, subject to the rules of the Board, every day, excepting legal holidays, and shall be in charge of the Secretary during the absence of the Board.

SEC. 5. For the purpose of preventing the spread of contagious disease among fruit and fruit trees, and for the prevention, treatment, cure, and extirpation of fruit pests and the diseases of fruit and fruit trees, and for the disinfection of grafts, scions, orchard debris, empty fruit boxes and packages, and other suspected material or transportable articles, dangerous to orchards, fruit and fruit trees, said Board shall make regulations for the inspection and disinfection thereof, which said regulations shall be circulated in printed form by the Board among the fruit-growers and fruit-dealers of the State, shall be published at least twenty days in two daily newspapers of general circulation in the State not of the same city or county, and shall be posted in three conspicuous places in each county in the State, one of which shall be at the county courthouse thereof. Such regulations when so posted shall be held to impart notice of their contents to all persons within this State, and shall be binding upon all persons.

SEC. 6. [Said Board shall appoint without their number a competent person, especially qualified for the duties of his office, who shall be known as Clerk of the Publishing and Quarantine Bureau of the State Board of Horticulture (to hold office at the pleasure of the Board), who shall be qualified, by experience and education as a compiler, to correct reports and essays; to present in a logical order all the information to be published, and shall give his whole time in such work, and such other duties as may be required of him by the Board and by reason of his official position, and shall have power to enforce all rules and regulations regarding the spread of insect pests, quarantining districts or nurseries found to be infected. He shall be paid for his services as Clerk of the Publishing and Quarantine Bureau of the State Board of Horticulture, one hundred and seventy-five dollars per month, to be paid as other State officers.]

SEC. 7. [The said Board, and in case of necessity during the recess of the Board, the said Clerk of the Publishing and Quarantine Bureau, may appoint such Quarantine Guardians as may be needed to carry out the provisions of this Act, whose duties it shall be to see that the regulations of the Board, and the instructions of the Clerk of the Publishing and Quarantine Bureau are enforced and carried out; said Clerk may appoint, in case of emergency, a deputy, who shall have the same power as his own, whose salary shall not exceed three dollars per day for each day's service performed, said services to be paid by the State Board of Horticulture. The said Quarantine Guardians shall report to the said Clerk, or to the State Board, all infractions or violations of said directions, regulations, and of the law in regard to quarantine, disinfection, and destruction, of insect and other pests injurious to fruit, fruit trees, or vines, and precautions against the spreading of all the aforesaid named pests and diseases. The salary of Quarantine Guardian shall not exceed three dollars per day, and shall be paid by the owners of orchards and other places and localities under quarantine regulations; and they may maintain an action therefor before any Justice of the Peace in any township in which any quarantined locality is wholly or in part situated, but in no case shall they have any claim upon the State for such services.]

SEC. 8. [It shall be the duty of the Secretary to attend all meetings of the Board and of the Executive Committee, and to preserve records of its proceedings and correspondence; to collect books, pamphlets and periodicals, and other documents containing information relating to horticulture, and to preserve the same; to collect statistics and other information showing the actual condition and progress of horticulture, in this State and elsewhere; to correspond with agricultural and horticultural societies, colleges, and schools of agriculture and horticulture, and other persons and bodies, as he may be directed by the Board; and prepare, as required by the Board, reports for publication.

He shall appoint, subject to the approval of the Board, a competent person as Clerk, and he shall be held responsible for the acts of said Clerk. He shall be paid for his services as such Secretary and ex officio Horticultural Officer, a salary of one hundred and seventy-five dollars per month. His clerk shall be paid a salary (as such Clerk) of fifty dollars per month, each to be paid as other State officers.]

SEC. 9. (Repealed.)

SEC. 10. The Board shall, biennially, in the month of January, report to the Legislature a statement of its doings, with a copy of the Treasurer's accounts for the two years preceding the session thereof, and abstracts of the reports of the Inspector of Fruit Pests, and Secretary.

SEC. 11. The Treasurer shall receive all moneys belonging to the Board, and pay out the same only for bills approved by it, and shall annually render a detailed account to the Board.

SEC. 12. (Relates to appropriations which are provided by the Legislature every two years.)

SEC. 13. This Act shall take effect and be in force from and after its passage, and all Acts or parts of Acts inconsistent or in conflict with the provisions of this Act are hereby repealed.

SEC. 14. [The President (and in his absence the Vice-President) and the two Commissioners for the State at large, shall constitute the Executive Committee; said committee shall have charge of the management of the affairs of the Board while the Board is not in session. The members of said committee shall receive their actual traveling expenses in attending quarterly meetings of the Executive Committee. The other members of the Board shall receive their actual traveling expenses (only) in attending semi-annual meetings of the Board.]

SEC. 15. [Vacancies occurring in any office shall be filled by appointment made by the President of the Board, with the consent of the Executive Committee, until the next meeting of the Board.]

SEC. 16. [The Board shall make and publish their reports annually.]

SEC. 17. [It shall be the duty of the County Boards of Horticulture to make quarterly reports, in writing, to the State Board of the condition of fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting, and as to quarantine against new insects, and as to carrying out of all laws relative to the greatest good of the fruit interest. Said Board shall publish said reports in bulletin form, or may incorporate so much of the same in their annual reports as may be of general interest.]

SEC. 18. [The expenditures necessary to be made in experiments in the different districts shall be determined by the Board. On application of one or more of the fruit-growers in such districts, the said Board shall select such person or persons to make such experiments, and pay the expenses thereof. The sum of not exceeding one thousand dollars, for traveling expenses, shall be allowed when the Board or the Executive Committee shall deem it necessary to send either the Clerk of Bureau or Secretary to direct and supervise such experiments; *provided*, that not more than one thousand dollars be expended in any one year for such traveling expenses.]

II.

LAWS RELATING TO COUNTY OR SUBORDINATE BOARDS.

AN ACT

TO PROTECT AND PROMOTE THE HORTICULTURAL INTERESTS OF THE STATE.

(Approved March 14, 1881; amended by an Act approved March 19, 1889.)

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section one of said Act is hereby amended so as to read as follows:

Section 1. [Whenever a petition is presented to the Board of Supervisors of any county, and signed by twenty-five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insects of any kind, injurious to fruit, fruit trees, and vines, codlin moth, or other insects that are destructive to trees, and praying that a Commission be appointed by them, whose duty it shall be to supervise their destruction, as herein provided, the Board of Supervisors shall, within twenty days thereafter, select three Commissioners for the county, to be known as a County Board of Horticultural Commissioners. The Board of Supervisors may fill any vacancy that may occur in said Commission by death, resignation, or otherwise, and appoint one Commissioner each year, one month, or thereabouts, previous to the expiration of the term of office of any member of said Commission. The said Commissioners shall serve for a period of

NOTE.—The amendments to original Act appear in brackets.

three years from the date of their appointment, except the Commissioners first appointed, one of whom shall serve for one year, and one of whom shall serve for two years, and one of whom shall serve for three years, from the date of appointment. The Commissioners first appointed shall themselves decide, by lot or otherwise, who shall serve for one year, who shall serve two years, and who shall serve three years, and shall notify the Board of Supervisors of the result of their choice.]

SEC. 2. Section two of said Act is hereby amended so as to read as follows:

Section 2. [It shall be the duty of the County Board of Horticultural Commissioners in each county, whenever it shall deem it necessary, to cause an inspection to be made of any orchard, or nursery, or trees, or any fruit-packing house, store-room, sales-room, or any other place in their jurisdiction, and if found infested with scale bug, codlin moth, or other insect pests injurious to fruit, trees, and vines, they shall notify the owner or owners, or person or persons in charge or possession of said trees or place, as aforesaid, that the same are infested with said insects, or any of them, or their eggs or larvæ, and they shall require such person or persons to disinfect or destroy the same within a certain time, to be specified. If within such specified time such disinfection or destruction has not been accomplished, the said person or persons shall be required to make application of such treatment for the purpose of destroying them as said Commissioners may prescribe. Said notices may be served upon the person or persons owning or having charge or possession of such infested trees, or places, or articles, as aforesaid, by any Commissioner, or by any person deputed by the said Commissioners for that purpose, or they may be served in the same manner as a summons in a civil action. If the owner or owners, or person or persons in charge or possession of any orchard, or nursery, or trees, or places, or articles, infested with said insects, or any of them, or their larvæ or eggs, after having been notified as above to destroy the same, or make application of treatment as directed, shall fail, neglect, or refuse to do so, he or they shall be deemed guilty of maintaining a public nuisance, and any such orchards, nurseries, trees, or places, or articles thus infested shall be adjudged and the same is hereby declared a public nuisance, and may be proceeded against as such. If found guilty, the Court shall direct the aforesaid County Board of Horticultural Commissioners to abate the nuisance. The expenses thus incurred may be a lien upon the real property of the defendant.]

SEC. 3. Section three of said Act is amended so as to read as follows:

Section 3. [Said County Boards of Horticultural Commissioners shall have power to divide the county into districts, and to appoint a local inspector for each of said districts. The State Board of Horticulture, or the Quarantine Officer of said Board, shall issue commissions as Quarantine Guardians to the members of said County Boards of Horticultural Commissioners, and to the local inspectors thereof. The said Quarantine Guardians, local inspectors, or members of said County Boards of Horticultural Commissioners, shall have full authority to enter into any orchard, nursery, or place or places where trees or plants are kept and offered for sale, or otherwise, or any house, store-room, sales-room, depot, or any other such place in their jurisdiction, to inspect the same, or any part thereof.]

SEC. 4. Section four of said Act is hereby amended so as to read as follows:

Section 4. [It shall be the duty of said County Board of Horticultural Commissioners to keep a record of their official doings, and to make a report to the State Board of Horticulture on or before the first day of October of each year, of the condition of the fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting and as to quarantine against insect pests and diseases, and as to carrying out all laws relative to the greatest good of the fruit interest. Said Board shall publish said reports in bulletin form, or may incorporate so much of the same in their annual reports as may be of general interest.]

SEC. 5. Section five of said Act is hereby amended so as to read as follows:

Section 5. [Each member of the County Board of Horticultural Commissioners, and each local inspector, shall be paid for each day actually engaged in the performance of his duties under this Act, payable out of the County Treasury of his county, such compensation as shall be determined by resolution of the Board of Supervisors of the county, before entering into the discharge of his or their duties.]

SEC. 6. Section six of said Act is hereby amended so as to read as follows:

Section 6. [Said County Boards of Horticultural Commissioners shall have power to remove any local inspector who shall fail to perform the duties of his office.]

SEC. 7. (Repealed.)

SEC. 8. Section eight of said Act is hereby amended so as to read as follows, and to be known as section seven of said Act, viz.:

Section 7. [If any member of the County Board of Horticultural Commissioners shall fail to perform the duties of his office, as required by this Act, he may be removed from office by the Board of Supervisors, and the vacancy thus formed shall be filled by appointment by the Board of Supervisors.]

SEC. 9. Section nine of said Act is hereby amended so as to read as follows, and to be known as section eight of said Act, viz.:

Section 8. [It shall be the duty of the County Board of Horticultural Commissioners to keep a record of their official doings, and to make a monthly report to the Board of Supervisors, and the Board of Supervisors may withhold warrant for salary of said members and inspectors thereof until such time as said report is made.]

SEC. 10. A new section is hereby added to said Act, to be known as section nine, and to read as follows, viz.:

Section 9. All Acts or parts of Acts in conflict with the provisions of this Act are hereby repealed.

SEC. 11. This Act shall take effect and be in force from and after its passage.

(New section added by special Act, Statutes 1891, p. 280.)

NEW SEC. 12. When a petition is presented to the Board of Supervisors of any county, as required by section one of said Act, the said Board of Supervisors may appoint a Commission, to consist of any number less than three members, at a compensation each of not less than four dollars, and if but one member, five dollars, for each day actually engaged in the performance of his duties under this Act; and all the provisions prescribing the duties of and conferring powers upon the County Boards of Horticultural Commissioners contained in said Act shall apply to the Commission appointed under this section.

This last amendment and Act was declared unconstitutional by the Superior Court of San Bernardino, April 29, 1896, in a case which grew out of an attempt on the part of the Board of Supervisors to reduce the number of members of the Commission from three to one. The Court, in its decision, says:

THE COURT'S DECISION.

The ground of this decision is that Section 24 of Article IV of the Constitution of the State prohibits the passing of such amendatory Acts. The Constitution says: "No law shall be amended by reference to its title, but in such cases the Act revised or the section amended shall be reenacted and published at length as revised or amended." In the very title of the second Act it states that it is amendatory of the Act which provides for a three-man commission, but it does not amend it by reenacting the law.

By the Act of 1881, entitled "An Act to protect and promote the horticultural interests of the State," it became incumbent on the County Boards of Supervisors to appoint County Boards of Horticultural Commissioners to act subordinately to the State Board of Horticulture, and made it mandatory upon the Boards of Supervisors to create and appoint such a Commission. The validity of this Act having been questioned, a mandamus suit was brought against the Board of Supervisors of Sonoma County, and Hon. John G. Pressley, Judge of the Superior Court of Sonoma County, on the 19th day of June, 1889, rendered the following decision, in which the validity of the Act, directing the Boards of Supervisors to establish County Boards of Horticultural Commissioners, is sustained:

On the 19th of March an Act of the Legislature was approved, entitled "An Act to amend an Act entitled 'An Act to protect and promote horticultural interests of the State,' approved March 14, 1881."

This Act (of March, 1889) provides that, "Whenever a petition is presented to the Board of Supervisors of any county, and signed by twenty-five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insects * * * that are destructive to trees, and praying that a Commission be appointed by them, whose duty it shall be to supervise their destruction, as herein provided, the Board of Supervisors shall, within twenty days thereafter, select three Commissioners for the county, to be known as a County Board of Horticultural Commissioners."

The duties of the Board so appointed are declared by the Act. It appears from the complaint that, in accordance with this Act, a petition was presented to and filed with the Board of Supervisors, signed by this plaintiff and twenty-six other persons possessing the qualifications prescribed by the Act, praying for the appointment of a County Board of Horticultural Commissioners for Sonoma County, and a demand was made on the Supervisors that they carry into effect the provisions of the Act, and appoint the Commissioners.

The Board refused to appoint Commissioners.

Twenty days have expired since the filing of the petition and the demand for action upon it, and still the Board of Supervisors refuse and neglect to make any selections or appointment of Commissioners.

This action is brought for a writ of mandate compelling the Board of Supervisors to make the selection and appointment as required of them by the Act.

A demurrer has been interposed to the complaint, and in support thereof, it is contended:

First—That the Act of 14th of March, 1881, of which the Act of 19th of March is amendatory, was repealed by an Act approved 13th of March, 1883, which provides for the appointment by the Governor of a State Board of Horticulture, and that in consequence of the Act of 1889 being an amendment of a repealed statute, it is nugatory.

The Act of 1883 does not, in express terms, repeal the Act of 1881, nor is that Act elsewhere expressly repealed. It is a well-settled legal principle that repeals by implication are not favored. A subsequent Act does not, by implication, repeal a prior statute unless the subsequent one entirely covers the provisions of the first, and so completely that every portion of the first is provided for by the second. There must appear an intent to entirely substitute one for the other.

Says Bishop in his work on Statutory Crimes, Section 154: "We have seen that every legislative Act in affirmative words is to be regarded, *prima facie*, as an addition to the mass of law; for such on its face it purports to be. Yet when it is inconsistent with the former law, it must, as the last expression of the legislative will, prevail. But repeals by implication, thus explained, are not favored. And a legislative intent to repeal an existing statute is never presumed. If two Acts, seeming to be repugnant, can be reconciled by any fair construction, they must be, when no repeal will be held to take place."

The same principle is laid down by Judge Field in the case of *Pierrepoint vs. Crouch*, 10 Cal. 316.

There are numerous other authorities to the same effect.

Is there any apparent intent to substitute one of these Acts for the other, or such repugnance as would destroy the first? Let us see. The first provides for a County Board of Horticulture. The second for a State Board. The first prescribes duties to be performed by County Boards of Supervisors. The second prescribes duties to be discharged by the Governor. The first provides for a Board of three Commissioners with local jurisdiction. The second for a Board of nine Commissioners with a jurisdiction coextensive with the State. The first authorizes Boards created by its authority to divide counties into districts. The second creates districts composed of several counties. The first requires duties to be performed by County Boards which are not required by the second, of the State Board. For instance: The first provides for proceedings against persons who, after notice, fail or refuse to treat infested trees as directed by the Board, and a destruction of trees by such Board when directed by a court. No such proceedings and destruction are provided for by the second. There are other differences between the two Acts which might be pointed out, but these are sufficient to show that there is no such similarity in the powers of the Boards created by them as would necessarily cause a conflict between these Boards, or would justify a court in holding that one Act repeals the other. I must, therefore, hold, that the Act of 1881 was not repealed by the Act of 1883, and was in full force when the amendatory Act of 1889 was passed. The Act of 1883 is an addition to the then existing legislation, and not a substitute for the Act of 1881.

Second—It was contended that Acts of the Legislature which provided that a duty imposed shall be performed within a certain time are directory and not mandatory. I cannot assent to that proposition. Where a Court or Board is directed by law to perform an act in a given time, the law, unless it declares the act may not be done after the expiration of the time, is so far directory as that the act is valid though done after the time fixed, but is not directory in the sense that the duty or act directed may be entirely disregarded or omitted. The time is given that the Board may have ample opportunity to act intelligently and with good judgment, but not to enable the Board or officer of whom the duty is required to disregard it entirely. I have no doubt but that the Board of Supervisors is required by the law in question to appoint a County Board of Horticultural Commissioners, and that it may be lawfully done after the expiration of the twenty days given them in the Act for deliberation.

Counsel referred to some authorities from other States in support of his contention. I do not think these authorities go to the extent claimed by him, and if they did, there being no such decision by our own Supreme Court, I would hold the law in this State to be different. The purpose of the Legislature was to give the Supervisors time to make judicious selections, and not to justify or authorize an annulment of the legislative will expressed by the statute.

III.

HORTICULTURAL QUARANTINE REGULATIONS.

At a meeting of the State Board of Horticulture, held in San Francisco, August 15, 1894, the following regulations were adopted, in accordance with Section 5 of the Act of 1883, creating a State Board of Horticulture, and are therefore binding upon all persons:

REGULATIONS

AMENDING ALL EXISTING REGULATIONS HITHERTO PASSED, AND TO TAKE EFFECT AND BE IN FORCE FROM AND AFTER AUGUST 15, 1894.

RULE I. All consignees, agents, or other person or persons, *shall*, within twenty-four (24) hours, notify the Quarantine Officer of the State Board of Horticulture, or a duly commissioned Quarantine Guardian, of the arrival of any trees, plants, buds, or cions at any point of debarkation in the State of California.

RULE II. All trees, plants, cuttings, grafts, buds, or cions, imported or brought into the State from any foreign country, or from any of the United States or Territories, are hereby required to be disinfected, as hereinafter provided, upon arrival at any point where they are to be unloaded; and, furthermore, if any of said trees, plants, cuttings, grafts, buds, or cions are found infested with insects, or with any fungi, blight, or other disease injurious to fruit or to fruit trees, or to other trees or plants, they *shall* remain in quarantine fourteen (14) days, or until the Quarantine Officer of the State Board of Horticulture, or a duly commissioned Quarantine Guardian, can determine whether the said trees, plants, cuttings, grafts, buds, or cions are free from live injurious insect pests, or their eggs, larvæ, or pupæ, *before* they can be offered for sale, gift, distribution, or transportation.

RULE III. All trees, plants, cuttings, grafts, buds, or cions, infested with any insects, fungi, blight, or other diseases known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, *are* hereby required to be disinfected before being offered for sale, gift, removal, distribution, or transportation.

RULE IV. All peach, nectarine, apricot, plum, or almond trees, and all other trees budded or grafted upon peach stocks or roots, all peach or other pits, and all peach, nectarine, apricot, plum, or almond cuttings, buds, or cions, raised or grown in a district where the "peach yellows" or the "peach rosette" are known to exist, are hereby prohibited from being planted or offered for sale, gift, or distribution within the State of California.

RULE V. All trees, plants, cuttings, grafts, buds, cions, seeds, or pits arriving from any foreign country, found infested with insect pests or their eggs, larvæ, or pupæ, or with fungi, or other disease or diseases hitherto unknown in this State, *are* hereby prohibited from landing.

RULE VI. Fruit of any kind grown in any foreign country, or in any of the United States or Territories, found infested with any insect or insects, or with any fungi, blight, or other disease or diseases, injurious to fruit or to fruit trees, or to other trees or plants, *is* hereby prohibited from being offered for sale, gift, or distribution within the State.

RULE VII. Transportable material of any kind, infested by any insect or insects, or their eggs, larvæ, or pupæ, or by any fungi, blight, or other disease or diseases known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, *is* hereby prohibited from being offered for sale, gift, distribution, or transportation, until said material has been disinfected by dipping it in boiling water and allowing it to remain in said boiling water not less than two minutes; such boiling water, used as such disinfectant, to contain in solution one pound of concentrated potash to each and every ten gallons of water.

RULE VIII. All trees, plants, cuttings, grafts, buds, or cions may be disinfected by dipping in a solution of three fourths of a pound of whale-oil soap (80 per cent) to each and every gallon of water; said whale-oil soap solution *shall* be kept at a temperature of 100° to 115°. Said trees, plants, cuttings, grafts, buds, or cions *shall* remain in said solution not less than two minutes. After said trees, plants, cuttings, grafts, buds, or cions have been disinfected they *shall* remain in quarantine fourteen (14) days for subsequent inspection, and if deemed necessary by the Quarantine Officer of the State Board of Horticulture, or a duly commissioned Quarantine Guardian, for further disinfection.

RULE IX. All trees, plants, cuttings, grafts, buds, or cions may be disinfected by fumigation with hydrocyanic acid gas, as follows: Said trees, plants, cuttings, grafts, buds, or cions *shall* be covered with an air-tight tent or box, and for each and every one hundred cubic feet of space therein, two thirds of an ounce of C. P. cyanide of potassium (98 per cent), one fluid ounce of sulphuric acid, and two fluid ounces of water *shall* be used. The cyanide of potassium *shall* be placed in an earthenware vessel, the water poured over the said cyanide of potassium, afterwards adding the sulphuric acid, and the tent or box to

be immediately closed tightly, and allowed to remain closed for not less than forty minutes. After said trees, plants, cuttings, grafts, buds, or cions have been treated with hydrocyanic acid gas, as above directed, they *shall* remain in quarantine for fourteen (14) days for subsequent inspection, and if deemed necessary by a member of the State Board of Horticulture, or the Quarantine Officer of said Board, or a duly commissioned Quarantine Guardian, for subsequent disinfection.

RULE X. All trees, plants, cuttings, grafts, buds, or cions imported or brought into this State *shall* be inspected upon arrival at first point of debarkation, and if found infested with mining scales (*Chthonaspis biclavis*) or other injurious insects which cannot be destroyed by the remedies required in Rules VIII and IX of these regulations, *are* hereby prohibited from being planted or offered for sale, gift, or distribution, and shall be proceeded against as a nuisance.

RULE XI. Any person or persons having in their possession trees, plants, cuttings, grafts, buds, cions, seeds, or pits, infested with any insect or insects, or with any fungi, blight, or other disease or diseases, injurious to fruit or to fruit trees, or to other trees or plants, and who refuse or neglect to disinfect the said trees, plants, cuttings, grafts, buds, cions, seeds, or pits, as is required by Rules VIII and IX of these regulations, after having been notified to do so by a member of the State Board of Horticulture, the Quarantine Officer of said Board, or a duly commissioned Quarantine Guardian, the said trees, plants, cuttings, grafts, buds, cions, seeds, or pits shall be declared a public nuisance, and shall be proceeded against as provided for by law.

RULE XII. Animals known as flying-fox, Australian or English wild rabbit, or other animals or birds detrimental to fruit or fruit trees, plants, etc., *are prohibited* from being brought or landed in this State, and if landed they *shall* be destroyed.

IV.

ENFORCEMENT OF THE HORTICULTURAL QUARANTINE REGULATIONS.

In a case brought before the Superior Court of Los Angeles, the constitutionality of the Act of 1881, as amended, was questioned as to its enforcement, and upheld. It was an action brought to declare a shipment of orange trees from Tahiti a nuisance and have them destroyed, they being infested with injurious insects, etc. The findings of the Court are as follows:

THE OPINION.

This is an action brought by the District Attorney of the County of Los Angeles, in the name of the people, for the condemnation and abatement as a nuisance of certain trees. The complaint alleges that in June, 1891, the defendants brought from Tahiti to San Pedro, in the County of Los Angeles, certain orange trees, numbering about 325,000, and that the same were, and still are, infested with scale insects and other pests injurious to fruit trees. That the Horticultural Commissioners of the County of Los Angeles notified defendants that the trees were so infested, and required them to eradicate and destroy the insect pests thereon. That defendants caused the process of disinfection to be performed upon said trees, but said process was unsuccessful, and, although frequently repeated, has not eradicated or destroyed said insects. That among said insects is a scale insect hitherto unknown in the State of California, which cannot be destroyed by any process of disinfection; and that the said scale insects with which the trees are infested, if not destroyed, will be introduced into the orange orchards of California, and the orange industry greatly injured, if not totally destroyed. That the said scale insects cannot be destroyed without the destruction of said trees; that the defendants are contemplating the removal of said trees into the interior of the State of California, and that the said scale insects would be thereby distributed among other trees and propagated and spread all over the State of California. The complaint prays a judgment of the Court that the trees be declared a nuisance and ordered to be destroyed.

Plaintiff relies, for its right to maintain the action, upon the provisions of the Act of the Legislature, approved March 19, 1891, declaring any orchards, trees, plants, or shrubs infested with insect pests injurious to plants, trees, etc., to be a nuisance, and also upon the theory that the trees in question are, under the general provisions of the Code, a public nuisance, and may be abated by an action brought in this manner.

It therefore becomes necessary for the Court to consider the power of the Legislature to adopt this statute, and the question whether, in the absence of statutory provisions, the action could be maintained.

My attention has not been directed to any constitutional limitation which affects the right of the Legislature to adopt a statute such as the one in question. The statute

does not determine that any specific orchard or trees are a nuisance, but leaves it to the courts to determine whether there exists a condition of affairs which will make any particular trees a nuisance, and is, in my opinion, constitutional.

The law of nuisance, under our codes, is practically but a reenactment of the common law; and while this case is peculiar in its character and circumstances (being the first of the kind tried in the State), and in many respects utterly unlike any case to be found in the reports, yet the duty to be performed by the Court is the application of decisions disposing of cases widely differing from this as to the facts, but laying down principles which, by analogy, can be applied to the facts of this case.

It is peculiarly the characteristic of cases, under the law of nuisance, that they are largely dependent upon surroundings. The common law is not an iron-cast system, to which every case must be fitted without regard to its particular circumstances, but is a system which derives its beauty and utility from the fact that it is the condensation of the wisdom and learning of centuries, modified from time to time by the circumstances of period and place. In the consideration of any case which is dependent, to a greater or less degree, upon the circumstances and surroundings of the community and State, it is the duty of the Court to take into consideration the condition and development of the industries which may be affected by its judgment, for the purpose of properly applying the rules of law to the circumstances of the case. The Court, therefore, in applying the principles of the common law and the decisions thereunder, takes into consideration all the facts to which those decisions and principles are to be applied.

"That new conditions and new facts may produce the novel application of a rule which has not been before applied in like manner, does not make it any less the common law; for the latter is a system of grand principles, founded upon the mature and perfected reason of centuries. It would have but little claim to the admiration to which it is entitled if it failed to adapt itself to any condition, however new, which may arise; and it would be singularly lame if it is impotent to determine the right of any dispute whatever. Having, as far as we have gone, met all difficulties by adhering to its doctrines, we have no ground to presume that we will have to go beyond its precincts for a solution of any which may arise. Every Judge is bound to know the history and the leading traits which enter into the history of the country where he presides. This we have held before, and it is also an admitted doctrine of the common law." (*Conger vs. Weaver*, 6 Cal. 544.)

The Court, therefore, takes judicial notice of the history, development, and character of the industries of California; of the fact that the production of fruits is one of the leading occupations in this State, and that a large portion of the people are dependent upon it. It takes judicial notice of the fact that a large portion of the land in this and adjoining counties is devoted to the cultivation of citrus fruits, and that the annual production and shipment of oranges is very great, and that the spread of any insect pest injurious to citrus trees must necessarily result in serious injury to that business, and in great loss and destruction of property.

That orchards and trees infested by scale or insect pests injurious to vegetation, and which will easily spread to other places, must be a nuisance, *prima facie*, seems too clear to require discussion, and would not receive it at the hands of this Court but for the fact that this is the first case of this kind.

"A nuisance is anything that worketh hurt, inconvenience, or damage." (Black, vol. 3, p. 213.)

"Anything which is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin, or any public park, square, street, or highway, is a nuisance." (Sec. 3479, C. C.)

"A public nuisance is one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal." (Sec. 3480, C. C.)

The kinds of nuisances which have been abated are almost innumerable in variety, each dependent upon the particular character and circumstances under which it exists.

In the case of *Campbell vs. Seaman*, 63 N. Y. 568, the use of bituminous coal, which produced vapors injurious to vegetation, was held to be a nuisance. Again, a house in so ruinous a condition as to be likely to fall upon the house of another, is a nuisance. (*Tenant vs. Goldwin*, 2 Ld. Raymond, 1893.) Buildings in an unsafe condition in a public street are common nuisances. (Wood's Law of Nuisances, p. 8.) Production of vapors injurious to vegetation is a nuisance. (Wood's Law of Nuisances, Sec. 536, *et seq.*)

It has been argued by defendant's counsel that a prospective nuisance will not be abated, and the authorities cited by them would be conclusive in this case if applicable to its facts. But the fallacy of their argument is that in the cases cited by them no considerable injury could be done until the actual existence of a nuisance could be shown. In the case at bar, before damage could be actually shown, it would be necessary for the scale insects in question to be disseminated through a considerable portion of the orchards of the State and their propagation have reached a stage at which it would be extremely difficult, if not impossible, to check and eradicate them.

It appears to me that this case belongs to that class in which, if the allegations of the complaint are true, a damage will be inferred, and it is not necessary to wait until it is actually done. It is similar in that respect to the cases in which diseased animals are taken to public places when there is danger of infection, to the cases of the storing of

explosives, and to the cases of condemnation of dangerous buildings, and places likely to be injurious to the health of the community—in all of which the abatement of the nuisance rests merely upon the reasonable apprehension of danger. The fact that the trees are at San Pedro does not prevent their being considered an existing nuisance, as the evidence shows that the larvæ of the scale may be carried by birds, insects, and the winds to distant portions of the county and State.

The evidence in the case shows that at the time of the arrival of the trees at San Pedro they were infested with eight different varieties of pests, and that subsequently they were treated six times with different processes for the destruction of the scale; that the treatment was successful as to all kinds except a species of scale hitherto unknown in California, called the mining scale or *Chionaspis biclavus*; and that all efforts to eradicate this scale have been unsuccessful, and seem to have been abandoned by defendants.

The evidence with regard to this scale is entirely that of expert witnesses, who, never having seen it before, are unable to testify positively as to its effects, other than from their opinion derived from familiarity with the cultivation of the orange, from experience with the other scale insects similar in character with which orange trees are infested, and from their observation of this insect found upon the trees in question. The evidence, and the inspection of the Court, however, show positively that the mining scale derives its nutrition and support entirely from the tree, and consequently must be injurious in a greater or less degree. The expert witnesses all agree in the opinion that it is injurious to the health of the tree, and that if introduced into the State it would occasion great injury to the orange orchards.

An entomologist and agent of the Department of Agriculture testified that he had made an examination of the trees at San Pedro, and found the mining scale upon them in a healthy condition on the day before the trial of the cause; that he did not know of its existence elsewhere in the State, and that there could be no doubt about its being detrimental, living at the expense of the tree. He was of the opinion that by some process the scale might be destroyed without the destruction of the trees, but was unable to give any method by which it could be done.

Alexander Crow, Quarantine Officer of the State Board of Horticulture, testified that he had inspected the trees eight or ten times, examined the scale in question, and found the live scale and larvæ. In his opinion the mining scale could not be destroyed without destroying the trees. He considered it a very destructive scale, and knew of no way by which it could be eradicated except by destroying the trees. It was, in his opinion, a more dangerous insect than the cottony-cushion scale, and would be very injurious to the orange industry.

The other witnesses testified substantially to the same opinions as those given by Mr. Crow.

The trees in question, now reduced in number to about 60,000, are contained in crates at San Pedro; and the evidence shows that, in an examination of the trees at this time, live scale is found on only a portion of the trees, but that a thorough examination would require five or ten minutes for each tree.

The evidence establishes all the allegations of the complaint, being open only to the objection that it is to a great extent merely expert opinion. But, under the circumstances, that is the best evidence of which the case is susceptible.

This evidence is practically uncontradicted by the defense, as no witness has been produced who claims to know any process by which this scale can be destroyed, or that it is not injurious.

The defense claims that the trees should be separated, and only those upon which the scale are found be destroyed. There is no doubt that the position of the defendants is correct, that in abating a nuisance no more property should be destroyed than is absolutely necessary for that purpose. But in this case the situation of these trees is such that there is no certainty that all are not infested, and if such separation can be made it should be done by defendants.

The period during which the case has been pending was sufficient to give the defense every opportunity to disinfect these trees.

From the evidence of the experts, and in the absence of any suggestion of a method by which the trees can be disinfected, the Court must conclude that it cannot be done without the destruction of the trees.

It therefore follows that the allegations of the complaint are sustained by the evidence. The Court is of the opinion that the statute of March 19, 1891, is constitutional, and that even in the absence of such a statute the trees in question are a nuisance under the Code, and that plaintiff is entitled to the relief demanded in the complaint.

Let findings and judgment be submitted in accordance with this opinion.

J. W. MCKINLEY,
Judge.

V.

TRANSACTIONS OF THE STATE BOARD OF HORTICULTURE.

APRIL 16, 1895.

The State Board of Horticulture met at 10 o'clock A. M., in pursuance to call issued by President Ellwood Cooper.

The following Commissioners were present: Messrs. Ellwood Cooper, L. W. Buck, Frank A. Kimball, Mark L. McDonald, Fred C. Miles, and J. L. Mosher. Absent: Messrs. A. Block, Sol. Runyon, and I. H. Thomas.

The minutes of November 21 and 22, 1894, were read and approved. President Cooper in a few chosen words, welcomed Col. Mark L. McDonald, the newly appointed Commissioner for the Sonoma District, into the Board.

Report of Treasurer.—The report of the Treasurer was read and ordered placed on file, as follows:

To the honorable the State Board of Horticulture :

GENTLEMEN: As your Treasurer, I beg to herewith present, for your consideration, my report since your last meeting. The following are the amounts paid to cover claims approved by your Executive Committee and allowed by the State Board of Examiners:

Nov. 19, 1894	\$429 58
Nov. 29, 1894	1,402 86
Dec. 18, 1894	496 62
Jan. 2, 1895	455 30
Jan. 22, 1895	292 85
Feb. 2, 1895	333 30
Feb. 28, 1895	756 42
 Total	 \$4,166 93
Amount expended as per last report	2,546 06
 Amount expended to date	 \$6,712 99
Appropriation	10,000 00
 Balance unexpended	 \$3,287 01

Respectfully submitted.

FRED C. MILES,
Treasurer.

Referred to Executive Committee.

Report of Secretary.—The report of the Secretary was read and referred to the Executive Committee, with full power to act.

Report of Quarantine Officer.—The report of the Quarantine Officer was read and ordered placed on file.

Commissioner Kimball moved that Mr. Buck be appointed a committee of one to interview the Governor, and request him to be present some time to-day. Carried.

On motion, a recess was taken until 3 o'clock P. M.

AFTERNOON SESSION.

There were present Messrs. Cooper, Buck, Kimball, Mosher, McDonald, Miles, and Thomas.

Commissioner Buck, on the committee to interview the Governor, reported that he was unable to see him, but had telegraphed to his

Secretary and expected an answer very soon; therefore, he moved that a recess be taken to Wednesday, April 17, 1895, at 10 o'clock A. M. Carried.

WEDNESDAY, April 17, 1895.

The Board met at 10 o'clock A. M. The following Commissioners were present: Messrs. Cooper, Buck, Kimball, McDonald, Miles, Mosher, and Thomas. Absent: Commissioners Block and Runyon.

Commissioner Buck reported that, on account of the Governor's illness, he had not been able to hear from him.

ELECTION OF OFFICERS.

The President read Section 3, Statutes of 1889, p. 89, relating to the election of officers, and declared the order of business to be the election of officers, in accordance with the law.

President.—Commissioner McDonald introduced the following resolution:

WHEREAS, Pursuant to Section 3, Statutes of 1889, p. 89, it becomes the duty of this Board to biennially elect a President thereof; and whereas, the term of office of the President of this Board has expired and a vacancy exists therein, two years having elapsed since his election; now, therefore, be it

Resolved, That we proceed to the election of a President of this Board, to hold office for the term of two years from the date thereof.

Adopted.

Commissioner Buck nominated Commissioner Cooper for the position of President, and, on motion, the Secretary was instructed to cast the vote of the Commissioners present for Ellwood Cooper for the position of President for two years; whereupon, he was declared elected by Vice-President Buck.

President Cooper spoke feelingly, and said he felt complimented, and thanked the Board for the confidence placed in him. He said he had worked for the fruit interests of the State, at a considerable outlay, for which he received no compensation from the State. He said he had lost over \$100,000 on his ranch in twenty-four years by the depredations of insect pests, and that fact alone was sufficient impulse to compel any man to fight insect pests. He further stated that he felt keenly the position in which the Board had been placed, and that while he had expected to be relieved from the great task and hard work, he had concluded to remain in the Board.

Vice-President.—Commissioner Mosher nominated Commissioner Buck for the position of Vice-President, and, on motion, the Secretary was instructed to cast the vote of the Commissioners present for L. W. Buck for Vice-President; whereupon, he was declared elected by President Cooper.

Vice-President Buck thanked the Board warmly, and said he felt highly complimented and that what he had done in the past was for the interest of the State and his friends.

VOTE OF THANKS.

President Cooper spoke of the importance of the work of Vice-President Buck, and recommended that a vote of thanks be tendered him as a mark of appreciation of a duty well performed.

Commissioner Kimball said he wished to accentuate all the President had said, and paid Vice-President Buck a high compliment. He then moved that a vote of thanks be tendered to Vice-President Buck, and that the same be spread upon the minutes of the Board, for his untiring work in behalf of the horticultural interests of the State and the Board.

Adopted unanimously by a rising vote.

Vice-President Buck replied that he had worked quite hard, but that he had done what he had, prompted by the good will of his associates.

Auditor.—Commissioner Mosher was unanimously elected Auditor, or Chairman of the Finance Committee.

Treasurer.—Commissioner Fred C. Miles was unanimously elected Treasurer.

Secretary.—B. M. Lelong was unanimously elected Secretary for the term of two years.

Quarantine Officer.—Alexander Craw was duly elected Quarantine Officer.

Clerk.—The Secretary, B. M. Lelong, announced to the Board the appointment of Miss Ella F. Hallahan as his Clerk, and asked the Board to confirm his appointment, which was done.

A recess was taken to meet in the afternoon at 2:30 o'clock.

AFTERNOON SESSION.

The Board met in the afternoon at 2:30 o'clock. All the Commissioners present at the morning session were present. The following resolution was adopted:

Resolved, That all matters pertaining to rental or removal of offices of the Board be referred to the Executive Committee, and full power is hereby given said committee to transact any and all business on behalf of said Board, until the next meeting of the Board, in November, 1895.

The minutes of the morning session were then ordered read. Commissioner McDonald moved that the same be approved. Motion carried.

Commissioner Buck moved that the Board adjourn to meet at the call of the President. Carried.

JUNE 6, 1895.

The meeting was called to order by President Cooper, but there being no quorum, an adjournment was taken to meet June 7, at 9:30 A. M.

JUNE 7, 1895.

The meeting was called to order by President Cooper, and the following Commissioners answered to their names: Cooper, Kimball, Mosher, McDonald, and Thomas. Absent: Runyon, Miles, and Block.

Letters were read from Commissioners Miles and Block, explaining their absence, which were ordered placed on file.

President Cooper announced the death of Commissioner Buck, the Vice-President of the Board.

Commissioner Kimball offered the following resolution:

IN MEMORIAM.

WHEREAS, It has pleased the All Wise Creator to remove, by death, L. W. Buck, the Vice-President of this Board; therefore, be it

Resolved, That in the death of ex-Senator Buck the horticulturists of the State have lost a steadfast friend, and the State a faithful servant; and, not only do these facts apply to the State, but the United States has lost one of its most energetic and progressive citizens;

Resolved, That the State Board of Horticulture, assembled this 7th day of June, 1896, at the rooms of the Board in San Francisco, hereby extend to the family of the late Commissioner our heartfelt sympathy in this, their greatest possible bereavement;

Resolved, That these resolutions be spread upon the records of the Board, and that a copy be engrossed and attested by its officers, and transmitted to the family of our late associate Commissioner.

Adopted unanimously by a rising vote.

The Executive Committee reported that they had examined the books and accounts, and had taken an inventory of the property in charge of the Board. The reports are as follows:

To the honorable the State Board of Horticulture:

GENTLEMEN: Your Executive Committee begs to report that they have examined the books and accounts, and find the same correct.

The following is a statement of expenses of the State Board of Horticulture for the year ending June 30, 1894:

Stenographer.....	\$306 25
Traveling expenses of Commissioners.....	626 35
Office furniture.....	91 90
Papers.....	31 10
Library.....	86 50
Janitor.....	236 60
Postage.....	395 75
Cartage.....	61 05
Freight.....	18 18
Woodcuts and electrotypes.....	436 74
Lithographs.....	150 00
Miscellaneous printing.....	169 90
Salary of Special Agents.....	894 50
Traveling expenses of Special Agents.....	91 25
Traveling expenses of Quarantine Officer.....	375 10
Traveling expenses of Deputy Quarantine Officer.....	20 40
Traveling expenses of Secretary.....	200 45
Sketches and drawings.....	561 82
Office supplies.....	156 72
Rent.....	1,645 00
Salary of Deputy Quarantine Officer.....	69 00
Repairing.....	23 40
Expressage.....	117 40
Experimenting.....	576 72
Midwinter Fair.....	2,077 11
Sundries.....	193 40
Seventeenth Fruit-Growers' Convention.....	183 35
Telegrams and telephone.....	203 55
Total.....	\$9,999 99

Expenses of the State Board of Horticulture for the forty-sixth fiscal year, up to April 30, 1895:

Papers.....	\$80 90
Office furniture.....	38 85
Library.....	15 00
Janitor.....	185 00
Traveling expenses of Commissioners.....	669 75
Cartage.....	135 93
Freight.....	211 79
Woodcuts and electrotypes.....	173 21
Miscellaneous printing.....	188 25
Salary of Special Agents.....	811 25
Traveling expenses of Quarantine Officer.....	310 20
Traveling expenses of Secretary.....	278 80
Sketches and drawings.....	226 08
Rent.....	1,350 00
Salary of Deputy Quarantine Officer.....	232 15
Repairing.....	279 13
Experimenting.....	1,258 25
Telegrams and telephone.....	151 70
Eighteenth Fruit-Growers' Convention.....	215 00
Sundries.....	280 74
Office supplies.....	88 17
Pure food exhibit.....	197 95
Postage.....	1,677 65
Expressage.....	37 95
	<hr/>
Appropriation.....	\$9,073 70
	<hr/>
Balance.....	10,000 00
	<hr/>
	\$928 30

Bills in the office which have not been presented to State Board of Examiners:

Rent.....	\$135 00
J. Caire.....	1 00
Press Clipping Bureau.....	8 40
Oscar Foss.....	8 80
A. Roman.....	14 00
Cox Seed Co.....	75
S. P. Taylor Co.....	10 50
H. S. Crocker Co.....	21 40
J. Isaac.....	165 35
B. M. Lelong.....	58 80
City Transit Co.....	23 28
	<hr/>
	\$447 28

Estimated expenses for remainder of year:

Rent (June).....	\$135 00
Alex. Craw, traveling expenses.....	85 00
Expressage, telegrams, etc.....	10 00
Salary of Janitor (June).....	20 00
Salary of Deputy Quarantine Officer (June).....	80 00
Traveling expenses of Secretary.....	20 00
Traveling expenses of Commissioners (Executive Committee).....	155 00
Experimenting.....	100 00
	<hr/>
	\$605 00
Bills, as above.....	<hr/>
	447 28
	<hr/>
Balance to credit of Board.....	\$1,052 28
	<hr/>
	928 30
	<hr/>
Deficit.....	\$125 96

All of which is respectfully submitted.

J. L. MOSHER,
FRANK A. KIMBALL,
ELLWOOD COOPER,
Executive Committee

INVENTORY OF STATE PROPERTY, IN CHARGE OF STATE BOARD OF HORTICULTURE.

To the honorable the State Board of Horticulture:

GENTLEMEN: We, your Executive Committee, beg leave to submit to you the following supplementary report, showing the amount of property of the State in our charge:

1 walnut Derby desk.	1 mallet.
1 walnut secretary.	1 saw.
1 double-top desk.	1 chisel.
1 large, 6-foot, standing desk.	1 safe, 5 feet high.
1 walnut stool for standing desk.	9 cuspidores.
1 small oak desk.	4½ dozen folding chairs.
1 president's desk.	22 large office chairs.
1 small walnut desk.	31 small office chairs.
2 large reading tables.	1 window duster.
2 medium reading tables.	1 can gasoline (for preserving fruit).
1 large walnut bookcase.	10 large bowls.
4 small tables.	3 porcelain buckets.
1 leather lounge.	4 glass dishes.
2 typewriters (1 worn out).	3 agate measures.
4 wall book-shelves.	6 agate ladles.
3 gas-stoves.	3 agate pans.
1 gas-heater.	19 stone jars, 3 gallons.
1 umbrella stand.	4 pitchers.
2 stepladders (1 for library).	160 glass bottles, various sizes.
1 walnut cabinet for specimens.	½ dozen test-tubes.
1 walnut copying-press stand.	1 test-tube rack.
4 letter-holder cases.	1 Tisdall globe.
1 corporate seal.	50 feet tubing.
2 copying-presses.	2 12x16 H. P. trays.
1 typewriter stand.	1 Blair lantern.
6 inkstands.	1 Ziens dissecting microscope.
3 State maps.	1 proportion divider.
1 United States map.	1 spirit gauge.
4 bookracks.	2 forceps.
98 paper boxes (files).	2 watchmakers' glasses.
4 18-foot operating tables.	1 pocket lens.
1 drawing table on horses.	1 common lamp.
1 perforator and eyeleteer.	1 Acme micro camera lamp.
1 stove (large).	1 3-inch bullseye lamp.
3 call bells.	1 Abbe S. S. condenser.
4 locks.	3 boxes microscope slides.
1 600-page day book (covered with duck).	1 large Bausch & Lomb microscope stand, with accessory and extra pinscope eye- piece.
1 600-page ledger (covered with duck).	1 small Bausch & Lomb microscope with eye-piece.
1 600-page cash book.	1 wooden triangle.
1 300-page record book.	1 square.
1 200-page record book (Executive Com.).	1 glass tube.
1 pigeon-hole case, 6x10 feet.	1 Steenhiel apl. lens and holder.
1 pigeon-hole case, 3x5 feet.	3 low shutters.
6½ dozen pigeon-holes.	1 ½ Perriscope lens.
1 library inkstand.	1 ½ Perriscope lens.
54 specimen-cases with glass fronts.	1 Blair front board.
5 rotary desk chairs.	1 Eastman roll holder, fitted.
15 frames for dry photo plates.	6 ½ plate-holders.
500 wooden boxes (for mailing parasites).	1 pocket compass and case.
1 carpet-sweeper.	4 dozen microscope slides.
1½ dozen newspaper files.	1 Bausch & Lomb photo-micro camera, with extension bellows.
1 duster and pan.	1 microscope stand (table).
1 post office iron box.	2 P. O. balances.
1 post office wooden box for papers.	1 pair 11-inch shears.
3 waste-baskets.	4 thermometers.
2 chair cushions.	1 water filter.
1 blackboard.	2 screwdrivers.
1 street sign.	1 lye hydrometer.
1 large sign in front, 16-foot.	1 sugar hydrometer.
1 large flag, 5x16 feet.	1 handmill for grinding bones.
2 small flags, 3x5 feet.	1 6-inch extension for camera.
2 pair portieres.	1 flange 5-inch lens.
1 merchandise truck.	1 kodak camera.
1 marking-pot and brush.	1 ½ Jess objective.
1 arm rest.	1 objective No. 624.
1 index clock.	1 objective No. 623.
2 zinc signs.	
1 open front p. heater.	
1 hatchet.	
1 hammer.	

- 1 objective No. 602.
- 1 objective No. 601.
- 1 camera lucida.
- $\frac{1}{4}$ gross slides.
- 1 stage forcep.
- 1 Eastman 5x8 camera.
- 24 Eastman plate-holders.
- 1 Beck wide angle lens—5x8.
- 1 Beck long view lens—5x8.
- 2 tripods No. 2.
- 2 focus cloths.
- 1 Packard shutter.
- 4 developing trays.
- 1 Tisdal lamp.
- 2 8-dr. graduates.
- 1 large hand magnifying glass.
- 1 small hand magnifying glass.
- 1 large reading glass.
- 1 club microscope stand.
- 1 H barometer.
- 1 testing glass tube.
- 1 1-gal. measure.
- 1 $\frac{1}{2}$ -gal. measure.
- 5 gals. alcohol.
- 16 feet rubber tubing.
- 1 tree cover—24x24 feet.
- 1 pair must scales.
- 1 broom.
- 1 envelope sealer.
- 1 Waterman pen (for officers when in field to fill out quarantine notices).
- 50 photo micrographs.
- 2 large glass propagating-houses for propagating parasites—20x14 feet.
- 1 gas generator.
- 1 rubber generator joint.
- 1 spray attachment.
- 1 fumigator.
- 1 cover for treating trees, made of B. S. drill.
- 1 hood made on 34 iron wire cloth, and crate.
- 1 generating apparatus, with pipes.
- 1 press (large).
- 1 press (laboratory).
- 15 upright tanks (large).
- 4 large square tanks.
- 1 furnace.
- 2 buckets.
- 100 feet hose.
- 1 washer with separator and table.
- 12 trays.
- 6 sorters.
- 2 pair pruning-shears.
- 3 work tables.
- 3 exhibit tables.
- 30 feet shelving and stand for holding exhibits of fruit in jars.
- 24 rubber stamps.
- 60 linear feet partitions, with glass above.
- 324 square feet book shelving.
- 1 dark room 6x10.
- 1 zinc sink.
- 2,000 negatives of fruits, etc. (estimated).
- 1,000 photo plates of fruits, etc. (estimated).
- 400 water-color drawings.
- 6 desk pads.
- 7 large frames.
- 48 small frames, water-color pictures.
- 24 window shades.
- 5 pounds salicylic acid.
- 5 pounds bisulphite soda.
- 5 pounds boracic acid.
- 5 pounds zinc chloride.
- 5 pounds arsenic.
- 5 pounds saltpetre.
- 2 packages sal ammonia.
- 10 pounds glycerine.
- 20 pounds potash.
- 1 pound kylene.
- 1 pound carb. acid mal. G. L.
- 2 pounds sodium bisulphite.
- 5 pounds sulphuric acid.
- 49 steel pressure plates.
- 1 dozen sheets, cork.
- 6 dozen naturalist's vials.
- 2 badges (Quar. Officer and Dep. Quar. Officer).
- 1 mounted "flying fox."
- 3 small steel stamps for marking cuts.
- 1 tin funnel, with filter back.
- 1 glass funnel.
- 19 brass faucets.
- 3 gross slide labels.
- 1 frame for collecting parasites.
- 1 sack moss for packing parasites.
- 18 $\frac{1}{2}$ museum jars.
- 36 $4\frac{1}{2}$ x11 $\frac{1}{2}$ museum jars.
- 15 9x18 museum jars.
- 60 6x12x36 museum jars.
- 154 6x12 museum jars.
- 77 6x18 museum jars.
- 144 $4\frac{1}{2}$ x12 museum jars.
- 36 10x12 museum jars.
- 72 $\frac{1}{2}$ -gal. top jars with cork lining.
- 62 1-qt. top jars with cork lining.
- 48 small top jars with cork lining.
- 64 cork sheets for lining specimen boxes.
- 1 towel rack.
- 750 specimen boxes for dried fruits.
- 24 books for preserving dried specimens.
- 1 hat rack.
- Carpets covering 1,924 square feet of space.
- 20,000 bulletins (estimated) of different sorts.
- 2,500 reports (estimated) for 1891, 1892, and 1893-94.
- 4 counters with showcases with glass fronts, 3x12 feet.
- 2 counters with showcases with glass fronts, 8x18 feet.
- 70 boxes with specimens of different varieties of fruits, nuts, etc.
- 62 plates with specimens of different varieties of fruits, nuts, etc.
- 39 small boxes with pits of different fruits, for nomenclature.
- 12 plate-holders, 10x12.
- 24 plate-holders, 2x8.
- 6 dozen dry plates, 5x8.
- 1 dozen dry plates, 8x10.
- 1 large case for electrotypes and woodcuts.
- 3 small proofreading top desks.
- 3 awnings.
- 1,500 (estimated) envelopes for reports.
- 2,500 (estimated) wrappers for bulletins.
- 2 racks for bulletins, 8x18 feet.
- 2 racks (shelving for reports), 8x18 feet.
- 12 duck sacks for shipping reports, etc.
- 1 case nails.
- 10,000 lithographs, beneficial insects.
- Assortment of dishes, etc., for experimenting.
- 928 woodcuts and electrotypes of different sizes, measuring 280 square feet.
- 1,859 books in library. (See catalogue.)
- 1 wrapping-paper holder—3 rolls.
- \$825 postage stamps of various denominations.

DEFICIENCY, ETC.

In accordance with law, the State Board of Examiners could not allow this Board to create a deficiency against the State, therefore we will be compelled to vacate these rooms and secure cheaper quarters, where all the property in our charge may be stored until some plan may be devised whereby we may continue operations. For two years past, aside from the office, we have conducted an experimental cellar, to find, if possible, a process for the treating of the ripe olive and convert it into a food product, as no satisfactory process was then known, and that branch of the industry was suffering. A process was discovered of great value to producers of olives in our State, and which was published in the report of the last Olive Growers' Convention. Therefore, your committee believes that enough was accomplished to warrant the maintenance of said cellar, the operation of which cost less than \$1,000 for the two years, which includes rent, cost of tanks, furnace, and appliances, together with all the labor required in experiments continued over nearly two years, all of which will have to be stored with the other property.

Respectfully submitted.

J. L. MOSHER,
FRANK A. KIMBALL,
ELLWOOD COOPER,
Executive Committee.

On motion of Commissioner McDonald, the report of the Executive Committee was adopted and ordered entered in full upon the minutes.

The following letter was read from the State Board of Examiners:

JUNE 1, 1895.

B. M. LELONG, Esq., *Secretary State Board of Horticulture*, 220 Sutter St., S. F., Cal.:

DEAR SIR: At a meeting of this Board, held on the 31st ult., your letter to Hon. L. W. Buck, and the letter from L. W. Buck, your Vice-President, were brought up.

According to the Act approved March 23, 1893 (Statutes of 1893, p. 285), the Governor, Secretary of State, and Attorney-General are given authority to allow a deficiency to be created *in excess of any appropriation of money made by law*, under certain conditions; but as the State Board of Horticulture has no appropriation for the forty-seventh and forty-eighth fiscal years, there cannot, therefore, be a deficiency when there is no appropriation, and therefore this Board has no power to allow your Board to create a deficiency as asked for.

Yours truly,

GEO. E. PRATT,
Secretary State Board of Examiners.

On motion, the above letter from the State Board of Examiners was ordered entered in full upon the minutes.

On moving from the old quarters in San Francisco, the question of ownership of partitions, etc., arose. The agent of the building claimed the same to belong to the building, in accordance with the "Tenement and Improvement Laws." To be on the safe side, the Attorney-General was asked for an opinion, as follows:

JULY 27, 1895.

HON. W. F. FITZGERALD, *Attorney-General*:

DEAR SIR: Will you please furnish us with an opinion upon the following, viz.:

In 1887 this Board rented one large room for offices at 220 Sutter Street, and as the room was in such condition as to require partitions to be put in, an agreement (verbal) was made with the owner of the building, as follows: The rent of the room was fixed at \$65 per month, the owner to put up the partitions and the Board to pay \$85 per month until said partitions were paid for, when the rent would again be reduced to \$65. This was done. The question now is, as to the ownership of the partitions, and our right to remove same. The agent of the building informs us that there is a law which provides that all partitions when attached to the building become permanent fixtures and cannot be removed. Please inform us if this is the case, and advise us what to do in the matter.

There are other partitions that were put in by the Board and for which the Board paid. Can we remove these. In the event that no partitions can be removed, can we take off the doors of said partitions, which are made of glass fronts and consist of four small doors and four large folding doors.

We are moving into the Mills Building in this city, and have given the agents notice that we will vacate the rooms on the last day of this month; it is therefore important that we should receive a reply at the earliest possible moment.

Thanking you for the same, I remain,

Yours truly,

B. M. LELONG,
Secretary.

His opinion, which barred us from removing any such partitions from the building, is as follows:

SAN FRANCISCO, July 31, 1895.

State Board of Horticulture, Mills Building, City:

GENTLEMEN: Replying to your favor of the 27th inst., and to your questions concerning your right to remove certain partitions and certain doors connected with said partitions, I am of the opinion:

First—That these partitions put in at your request by the owners, and for which you were required to pay an additional rental to cover the cost of putting them in, do not, in the absence of any special agreement to that effect, belong to your Board, and that, therefore, you have no right to remove them.

Second—That as to the partitions put in and paid for by the Board, the question as to whom they belong is more doubtful. However, if fixtures of this character are removed in any event by a tenant, they can only be removed during the term of the lease under which they were put in; and as the original lease terminated long since, and as you did not make a reservation or agreement with your landlord for the removal of these partitions, I am of the opinion that they cannot be removed.

Third—That the doors to which you refer are a part of the partitions, and therefore cannot be removed by you.

Respectfully,

W. F. FITZGERALD,
Attorney-General.

The items of expenditures from July 1st to October 1st, are as follows:

Janitor	\$21 50
Expressage, cartage, and telegrams	6 85
Traveling expenses of Commissioners	22 50
Supplies	9 60
Extra help, painting, etc.	34 65
Moving furniture, fixtures, etc.	55 00
Interest	40 67
Rent, July (front rooms)	50 00
Rent, July (rear rooms)	35 00
Rent, August (storeroom)	15 00
	<hr/>
	\$290 77
<i>Receipts.</i>	
Donations	\$270 00
Sale of parasites	15 00
	<hr/>
	\$285 00
Deficiency	\$5 77

Outstanding bills to date:

Carpet Cleaning Co., cleaning and laying carpets	\$31 75
Sketches	75 00
Miscellaneous printing and supplies	20 25
Subscriptions to papers, about	50 00
Rent of storeroom, September and October	30 00
	<hr/>
	\$207 00
Subscriptions due November 1, 1895	50 00
	<hr/>
Total deficiency	\$162 77

The fiscal year closed July 1, 1895, and the following are the expenditures for the year:

Office furniture	\$38 85
Papers	61 40
Library	15 00
Janitor	205 00
Traveling expenses of Commissioners	814 85
Cartage	147 93
Freight	235 05
Woodcuts and electrotypes	173 21
Miscellaneous printing	200 75
Salary of Special Agents	911 25
Traveling expenses of Quarantine Officer	371 95
Traveling expenses of Secretary	278 80

Sketches and drawings.....	\$228 08
Rent.....	1,620 00
Salary of Deputy Quarantine Officer.....	455 50
Repairing.....	282 18
Experimenting.....	1,268 80
Telegrams and telephone.....	152 20
Eighteenth Fruit-Growers' Convention.....	215 00
Sundries.....	286 89
Office supplies.....	97 07
Pure food exhibit.....	197 85
Postage.....	1,689 65
Expressage.....	45 05
Total.....	\$9,999 36
State appropriation.....	10,000 00
Balance.....	\$0 64

Commissioner Block offered the following resolution, which was, upon motion, adopted:

WHEREAS, The State made no appropriation for rent of rooms, nor any other incidental expenses for the State Board of Horticulture; and whereas, Mr. D. O. Mills subscribed an amount representing in rent a sum of \$3,720 for two years, ending July 1, 1897; also donated the necessary heating, lighting, and janitor service; therefore, be it

Resolved, That the thanks of this Board be tendered to Mr. Mills for his generosity and public spirit.

Commissioner Kimball moved that a committee of three be appointed on offices, etc., to interview the Mayor of San Francisco as to securing rooms in the City Hall, to act in conjunction with the President. Motion carried.

The President appointed Commissioners McDonald and Mosher and Secretary B. M. Lelong.

Commissioner McDonald moved that the question of removal, rent, etc., be referred to same committee. Adopted.

Commissioner Cooper called attention to the law relating to vacancies, and that a vacancy now existed in the office of Vice-President, caused by the death of Vice-President Buck.

Commissioner Kimball moved that the Board proceed to the election of a Vice-President, to fill the unexpired term of Vice-President L. W. Buck, deceased. Motion carried.

Commissioner Kimball nominated Commissioner McDonald, and moved that the Secretary be instructed to cast the vote of the Commissioners present for Colonel McDonald; whereupon, President Cooper declared him duly elected.

Vice-President McDonald thanked the Board for their confidence and the honor bestowed on him, and said he felt a delicacy in undertaking to fill a place occupied by the Commissioner we have just lost, and promised to serve to the best of his ability.

On motion, the President and Secretary were instructed to notify the Governor of the death of Commissioner Buck.

On motion, the Board adjourned to meet at the call of the Chair.

SACRAMENTO, November 4, 1895, 2 P. M.

President Cooper called the meeting to order, and the following Commissioners answered to their names: Cooper, Block, Thomas, Miles, and Runyon. Absent: McDonald, Mosher, and Kimball.

The minutes of the meeting of June 7, 1895, were read and approved. Letters were read from Commissioners Kimball, McDonald, and Mosher, each regretting his inability to attend.

The report of the Secretary was read, and upon motion, was received and ordered placed on file.

The report of the Quarantine Officer was read, and was, upon motion, ordered placed on file.

A recess was then taken to meet at the call of the President.

SACRAMENTO, November 4, 1895, 7:30 P. M.

As per call from President Cooper, and in pursuance to adjournment, the Board met at 7:30 o'clock P. M. There were present Commissioners Cooper, Thomas, Block, Runyon, and Miles. Absent: Commissioners McDonald, Kimball, and Mosher.

Letters were read from Messrs. A. B. Chapman, of San Gabriel, Timothy Hopkins, of Menlo Park, Nathan B. Blanchard, of Santa Paula, The Limonia Company, of Ventura, Saratoga Packing Company, of Los Gatos, E. E. Goodrich, of Santa Clara, and others, transmitting certain amounts for use of the Board.

On motion of Commissioner Block, a special vote of thanks was tendered to each for their generosity and public spirit.

SAN FRANCISCO, May 6, 1896.

President Cooper in the chair.

Commissioner Kimball offered the following resolution:

Resolved, That the offices of the Board be moved to the State Capitol, at Sacramento, in accordance with Governor Budd's wishes.

Adopted.

Commissioner Buck moved that such removal take place as soon as sufficient funds can be provided to defray the expenses of removal, and that the Executive Committee be requested to confer with the Governor to this end. Carried.

Commissioner Kimball moved that December 1st, 2d, 3d, and 4th be fixed as the time for the next State Fruit-Growers' Convention. Carried.

Commissioner Buck moved that the next convention be held at the State Capitol, at Sacramento. Carried.

Commissioner Kimball moved that Commissioners Stephens and Miles and the Secretary be appointed a committee on arrangements for the next convention. Carried.

Also, that Commissioner Buck and the Secretary be appointed a committee on essays and programme. Carried.

Adjourned to meet at call of President.

EXPENDITURES.

Since we have established our offices in the State Capitol, in accordance with the Governor's wish, our expenses have been nominal, as our supplies are furnished by the Secretary of State, as well as light, etc. The offices are well equipped and are all that could be desired. Postage stamps are among our heaviest items of expense, but these were provided; so that the expenses in conducting the affairs of the Board, including moving to the Mills Building from 220 Sutter Street, and from San Francisco here, were nominal, as follows:

Telegrams and expressage	\$29 05
Traveling expenses	216 95
Rent of storeroom in San Francisco	185 00
Extra help	144 25
Interest	55 17
Installing and repairs	143 71
Cartage and freight	203 91
Papers	33 30
Books	15 50
Translation	10 75
Printing	7 25
Sundries	142 53
Postage (extra)	10 50
Janitor	45 00
Expenses of clerk	100 00
Distributing parasites	74 17
Total	\$1,417 04
Receipts, all sources	1,243 80
Deficit	\$173 24
Bills outstanding	142 29
Total deficit	\$315 53

Matters of great import are constantly being reported and investigations are made promptly. Our offices are now located on the first floor of the State Capitol, with a workroom on the third floor, and we use the garret for storage.

ELLWOOD COOPER,
President.

Attest:

B. M. LELONG,
Secretary.

VI.

INSECT PESTS AND TREE DISEASES LIABLE TO BE INTRODUCED INTO THE STATE, AND ESPECIALLY TO BE GUARDED AGAINST.

While the strictest quarantine against insect pests and the tree diseases has been maintained by this Board, ably seconded by the County Boards of Horticultural Commissioners throughout the State, a note of warning against injurious insect pests and diseases, and their possible introduction at this time, should not be passed unheeded.

Among the numerous pests abounding in foreign countries and the Eastern States, which should be especially guarded against, are the following which are briefly described, with notes and comments by scientists:

THE PEAR PSYLLA.

Psylla pyricola, Foster.

(Plate I, Fig. 7.)

This insect, of European introduction, has caused great loss to pear crops of New York. While it has been known for several years, the damage inflicted has been greater in the past five years, and the loss sustained by its ravages has been enormous. In Bulletin No. 108, of the Cornell University Experiment Station, its life-history and distribution are given, showing it to have spread from Salisbury, Conn., where it made its first appearance in 1832, to Massachusetts, New York, Illinois, Maryland, Virginia, and Canada.

This insect belongs to the family of insects known as jumping plant-lice, from the leaping habit of the adult insects.

"During severe attacks of this pest, old trees put forth but little new growth, new shoots often droop and wither in May, the leaves turn yellow, and the fruit grows but little, and in midsummer the leaves and half-formed fruit often fall from the trees. The insect also indicates its presence by secreting large quantities of a sweet, water-like, sticky liquid, called "honey-dew," which often covers all parts of the tree; it has literally rained from the leaves, in some cases, and smeared the backs of horses during cultivation. A black fungus soon grows all through this honey-dew, and thus gives the tree a disgusting, blackish appearance, as if treated with a thin coat of black paint or soot. Pear trees, of all varieties and ages, are attacked in this State [New York]. Although the indications of the presence of some enemy is so conspicuous, the depredator is so small as to be easily overlooked." (Professor Slingerland, in Bulletin No. 108, Cornell University Experiment Station.)

This insect spreads from orchard to orchard somewhat slowly, but in nearly all cases reported it has been taken to other localities on pear stocks.

NEW YORK PLUM SCALE.

Lecanium juglandis, Bouche.

This scale insect has caused much damage to the plum trees of western New York, especially in 1894. The Cornell University Experiment Station, in the December bulletin (No. 83) of that year, discussed the damage done in detail, and mentioned the great losses sustained. Bulletin No. 108, January, 1896, says:

"The serious picture we drew in Bulletin 83 of the ravages of the insect did not tell half the truth. Before the winter was far advanced, it was found that the strain on

many trees from so many millions of little pumps sucking out their vital fluid—the sap—had been too great. In one orchard three hundred of the oldest bearing trees had succumbed in January, and three hundred more died before spring.”

This scale is of European introduction, and from accounts given by entomologists, is a very serious pest. Scale insects are very easily transported on nursery stock, and the greatest care must therefore be exercised in this respect. So far its presence seems to be confined to western New York, and the plum appears to be its food plant in particular.

THE BUD MOTH.

Tmetocera ocellana.

(Plate I, Fig. 9.)

This insect has of late played great havoc in the apple orchards of western New York, and is considered by the growers of that State to



Fig. I. Work of the bud moth in opening leaf buds.

be one of the most destructive to orchards, and one of the most difficult to destroy. This bud moth is closely allied to the codlin moth, which it resembles in size and form, but differs from it in structure, in color, and in its habits.

“This bud moth has come to be recognized by many of the most extensive apple-growers in western New York as the most injurious and hardest to fight of any insect now present in their orchards. It works in the opening leaf and flower buds, and often nearly the whole crop on many trees is destroyed while yet in the bud. It is also especially destructive when it attacks recently budded or grafted trees and nursery stock. Besides apple, it also feeds upon pear, plum, cherry, quince, and peach trees, and black-berry buds. Thus the fruit-growers have to fear, in the bud moth, a pest which is capable of literally ‘nipping in the bud’ a prospective crop of fruit, a graft, or budded stock.” (Bulletin No. 107, Cornell University Experiment Station, p. 57.)

This moth is of European introduction and has been known in Europe for over half a century. In the East it was first discovered in Massachusetts in 1869, where it did much damage. The same year it also appeared in Pennsylvania, where it also did considerable damage, and in 1870 made its appearance in Canada, attacking plum trees. In

1879 it was found in Washington, D. C., and in 1885 in Nova Scotia. It was discovered in 1887 in Rochester, and in 1888 and 1890 in Maine, where it proved very injurious, damaging the apple and blackberry crops.

"Throughout Massachusetts, New York, and Canada the insect appeared in very destructive numbers in 1891, and in Michigan in 1892. It has been found in Missouri and two or three years ago was introduced into Idaho." (Bulletin No. 107, Cornell University Experiment Station, p. 58.)

Thus it will be seen that we have the insect near the border-line, and nothing but strict vigilance will stop its introduction into our State. The moth spreads very rapidly, but is most easily transported from one locality to another on nursery trees. The larva of the moth, in its half-grown state, passes the winter hidden under the flaps of buds, of the small limbs or twigs, or under some other convenient place, and in the spring makes its appearance in the locality where the tree is transported. The moth is reported to have but one brood a year, and usually lays its eggs in June and July. The caterpillars hibernate when half-grown.

This insect has so far proved very hard to combat, and no effective remedy has as yet been discovered.

THE PLUM CURCULIO.

Canotrachelus nenuphar, Herbert.

This insect is a very dangerous pest, and the most injurious known to the plum family. It abounds throughout the Eastern States, where, owing to its ravages, the culture of the plum and apricot has almost been abandoned. It also attacks the peach, the cherry, and the nectarine. So far it has baffled all efforts put forth to combat it. No effective remedy has as yet been found. We have exercised the greatest vigilance to prevent its introduction into our State, for should it appear here the prune interest would suffer immensely, and its culture will have to be abandoned.

THE GYPSY MOTH.

Ocneria dispar.

In 1868 this insect was introduced into Massachusetts from Europe by a Frenchman, with the view of experimenting with them for raising silk. Instead of proving beneficial they have caused great damage to that State, entailing an expense of \$300,000 annually in combating them. All efforts in this direction have as yet proved only temporary, and whether the insect will ever be exterminated, time can only determine.

This insect feeds on apple, plum, cherry, quince, elm, linden, locust, maple, birch, oak, willow, poplar, arbor vitæ, and numerous other plants, including poison ivy, and in fact it is a question if any tree or plant would be exempt from its attacks. (See Plate III.)

THE CIGAR-CASE BEARER.

Coleophora fletcherell, Fernald.

(Plate I, Fig. 5.)

During 1894 the orchards of western New York suffered immensely from the attacks of this insect, which is considered a very serious pest. This insect is widely distributed throughout the State of New York,

and is also very numerous in Canada and Nova Scotia. The species is very small and of peculiar habits in all its stages, and is therefore difficult to notice, except by the peculiar cases made by the larvæ, resembling a miniature cigar, through which its presence is most easily observed. The moth is of a steel-gray color and very delicate.

"Briefly summarized, the life-history of this case-bearer is as follows: The insect spends about seven months (from September 15th to April 15th) of its life in hibernation, as a minute, half-grown caterpillar, in a small case attached to a twig. In the spring the caterpillars attack the opening buds, the expanding leaves, the stems of the flowers and fruit, and the forming fruit. By May 20th the hibernating case, with its spring additions, is discarded for another and larger cigar-shaped case, which the caterpillar deftly makes from pieces of the upper and lower skins of the leaves. Protruding themselves from these cases, they eat through one skin of the leaf, and mine out the inner tissues over an irregular area as far as they can reach and not let go of their case. In the latter part of June, they cease feeding, securely fasten the cases to the leaves or branches, and change to pupæ within. The moth emerges in about three weeks, and soon lays minute, pretty yellow, pitted eggs among the hairs of the young leaves. The egg state lasts about two weeks, the little caterpillar emerging about July 15th. They work as miners in the tissue of the leaf for two or three weeks, then abandon their mining habit and construct their curious little curved cases from bits of the skins of the leaves. By September 15th they have all migrated to the twigs, whence they pass the winter in their cases." (Bulletin No. 93, Cornell University Experiment Station, p. 227.)

The insect is so very small that only an expert can detect its presence on nursery trees, therefore it can be seen what great care must be exercised to prevent its introduction into our State. (See Plates I and II).

PEACH YELLOWS.

In 1891 a bulletin on the peach yellows was issued by this Board, warning the fruit-growers to be more cautious in importing trees from regions in the East where the peach yellows abounds, lest the disease might be introduced here; together with a map showing its distribution, also, photo plates showing the great havoc wrought by it and what would be the ultimate results if it ever attained a foothold in our State. All the combined efforts of the experts employed have not as yet detected the cause of the malady nor effected a cure in a single instance.

"If yellows exists in some parts of a State and not at all in others, I should consider it safe to import from non-infected regions (a) provided they are not very close to the infected regions, and (b) provided it can be shown that buds as well as stocks came from healthy localities. I should regard it as unsafe to get pits from infected districts. In reference to cions or buds, it is *very unsafe* to import them from infected districts." (Letter, dated August 24, 1891, from Prof. B. T. Galloway, Chief of the Division of Vegetable Pathology of the Department of Agriculture.)

"Yellows is a distinct disease. It attacks peach trees of all ages and in all conditions of vigor, seeming to have preference for those which are thrifty. It is *incurable*, and its termination is always fatal. It is communicable from tree to tree. Extermination of all affected trees, root and branch, is the *only* method of keeping the disease at bay." (Prof. L. H. Bailey, Bulletin No. 75, Cornell University Experiment Station, 1894, p. 406.)

We could quote from innumerable authorities to show the great danger of its being introduced here and the devastating results that would follow, but those herein quoted being the highest in the country, we deem them sufficient. Prof. Erwin F. Smith, the specialist on the yellows and rosette, employed for many years by the Department of Agriculture, sounded a note of warning, as follows:

"In peach-growing States now free from the disease it would be wise to prohibit the introduction of all trees from infected areas. Certainly, if yellows does not now occur in California (and by diligent inquiry I have failed to ascertain that it does), the greatest care should be taken to prevent its introduction, even to the extent of legislation strictly

prohibiting the importation of peach trees from the Eastern United States. Unless such steps are taken the appearance of yellows in orchards on the Pacific Coast is only a matter of time." (Bulletin No. 9, Section of Vegetable Pathology, Department of Agriculture, 1891, p. 177.)

In 1891, the fruit-growers in convention assembled at Marysville, passed the following resolutions:

Resolved, That it is the sense of this convention that our fruit industry is in imminent danger from the introduction of a disease known as "The Yellows," and infesting many of the fruit-growing sections of the East.

Resolved, That in view of all known facts regarding the disease, it is of vital importance to the fruit interests of this State that no trees grafted or budded upon peach stocks grown outside of the State of California, nor any buds, cions, cuttings, or pits from such trees, be imported into this State from Eastern States, even though such trees are apparently free from disease.

Resolved, That we pledge ourselves not to buy any such trees, buds, etc., and that we will discourage, in every proper way, their importation, and also that we will not deal with those who, from this time on, are known to import such trees from the East.

Resolved, That we believe that the Boards of Supervisors of the several counties of the State should use all the authority vested in them to exclude all Eastern stock grown on peach roots, or, if introduced, to use all lawful means to have them immediately destroyed.

Since then the most careful watch has been exercised over all shipments of trees from the East throughout the State, but the subject is deemed of so much importance that it was considered advisable to again call attention to the dangers that may befall us if the warnings are disregarded.* (See Plates IV and V.)

PEACH ROSETTE.

This is another deadly disease of the peach, but so far is not so generally distributed; nevertheless, it is as much to be feared as the yellows.

VII.

INSPECTIONS OF STEAMERS, ETC.

In the inspection of steamers and vessels, the same precaution has been exercised as formerly, to prevent the possible introduction of new insect pests or diseases on plants and trees brought here by passengers and importers from foreign countries, where such pests and diseases abound. In several countries these enemies to fruit culture have caused great loss to the growers and have made it almost impossible for them to continue the business. We have had the kind and valuable assistance and coöperation of the Custom-House officers, the Surveyor of the Port and his staff, and also of the Postmaster at San Francisco and the Postmaster-General, for which we beg to make due acknowledgment.

The following list comprises the number of vessels arriving at the port of San Francisco, and the number of plants, trees, etc. (and dis-

*See Reports of Prof. Erwin F. Smith, Division of Vegetable Pathology, Department of Agriculture, 1888 and 1891. Also, Report of State Board of Horticulture, 1891.

position made of same), inspected, from July 2, 1894, to August 29, 1896:

LIST OF VESSELS THAT ARRIVED IN THE STATE WITH TREES OR PLANTS ON BOARD.

Date.	Vessel.	From.	Contents.	Disposition.
1894.				
July 2	Peru	China and Japan ...	4 sago palms in vases.	Clean, passed.
July 6	Monowai	Australia and New Zealand.	5 ferns in pots..	Clean, passed.
July 21	City of Rio de Janeiro.	China and Japan ...	3 lots ornamental plants.	Part destroyed; sago passed.
July 28	Australia	Honolulu	2 lots plants	Dipped.
July 30	Gaelic	China and Japan ...	5 cases orchids, 1 lot plants.	Clean.
Aug. 2	Alameda	Australia and New Zealand.	3 cases plants, 1 lot plants.	Part destroyed, others disinfected.
Aug. 10	City of Peking....	China and Japan ...	5 raphis	Clean.
Aug. 18	China	China and Japan ...	7 lots plants	Part destroyed.
Aug. 25	Australia	Honolulu	8 boxes plants, 2 lots plants.	Part destroyed.
Aug. 28	Belgio	China and Japan ...	2 lots plants, cage Japanese live crickets.	Plants clean; crickets destroyed.
Aug. 30	Mariposa	Australia and New Zealand.	7 cases plants, 3 lots plants.	Fumigated.
Aug. 31	Acapulco	Central America	2 lots plants	Clean.
Sept. 11	San Blas	Central America	1 lot plants	Clean.
Sept. 16	Oceanic	China and Japan ...	2 cases orchids, 2 plants.	Orchids clean; plants destroyed.
Sept. 18	San Juan	Central America	2 cocoanut p'lms	Clean.
Sept. 22	Australia	Honolulu	6 plants	Clean.
Sept. 24	City of Rio de Janeiro.	China and Japan ...	1 lot plants	Part destroyed.
Sept. 29	Monowai	Australia and New Zealand.	A few ferns.....	Clean.
Sept. 30	Colon	Central America	3 palms	Clean.
Oct. 4	Gaelic	China and Japan ...	1 lot plants	Clean.
Oct. 11	City of Sydney....	Central America	1 lot plants	Clean.
Oct. 20	Australia	Honolulu	1 lot plants	Destroyed.
Oct. 21	City of Peking....	China and Japan ...	4 lots plants	Part destroyed.
Oct. 25	China	China and Japan ...	21 cases plants, 3 crates plants.	Part destroyed, others fumigated.
Oct. 26	Alameda	Australia and New Zealand.	2 cases plants, 6 lots plants.	Part fumigated.
Nov. 7	Belgio	China and Japan ...	2 crates plants, 2 cases plants.	Fumigated, and part destroyed.
Nov. 13	Peru	China and Japan ...	6 cases plants, 7 lots plants.	Part clean, others fumigated.
Nov. 17	Australia	Honolulu	3 lots plants	Clean.
Nov. 17	Galilee	Tahiti	1 box hibiscus ..	Disinfected.
Nov. 28	Oceanic	China and Japan ...	2 lots plants	Fumigated.
Dec. 1	San Juan	Central America	1 case orchids ..	Clean.
Dec. 3	City of Rio de Janeiro.	China and Japan ...	57 cases plants, 3 lots plants.	Part destroyed, others fumigated.
Dec. 11	Colon	Central America	2 lots plants	Part destroyed.
Dec. 14	Gaelic	China and Japan ...	49 cases plants..	Fumigated, part destroyed.
Dec. 15	Australia	Honolulu	3 lots plants	Part destroyed.
Dec. 17	San José	Central America	1 plant	Clean.
Dec. 22	Arawa	Australia and New Zealand.	20 cases plants..	Fumigated.
Dec. 23	City of Peking....	China and Japan ...	36 cases plants..	Part destroyed.
1895.				
Jan. 6	China	China and Japan ...	13 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Jan. 12	Belgio	China and Japan ...	28 cases plants, 3 lots plants.	Part destroyed, others fumigated.
Jan. 21	Alameda	Australia and New Zealand.	3 lots plants	Dipped.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

Date.	Vessel.	From.	Contents.	Disposition.
1895.				
Jan. 23	Peru	China and Japan	7 cases plants, 8 lots plants.	Part destroyed, others fumigated.
Jan. 24	St. Paul	Mexican ports	2 palms	Clean.
Feb. 1	Oceanic	China and Japan	40 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Feb. 6	Australia	Honolulu	2 lots plants	Destroyed.
Feb. 15	Mariposa	Australia and New Zealand.	1 box ferns	Clean.
Feb. 22	City of Sydney ...	Central America	2 boxes plants	Part destroyed.
Feb. 24	Gaelic	China and Japan	4 cherry trees	Destroyed.
Mar. 2	Australia	Honolulu	4 palms	Destroyed.
Mar. 2	City of Peking ...	China and Japan	Few ferns	Clean.
Mar. 6	Acapulco	Central America	46 cases plants	Fumigated.
Mar. 14	Colima	Central America	3 lots plants	Part destroyed.
Mar. 14	Arawa	Central America	4 plants	Clean.
Mar. 14	Arawa	Australia, New Zea- land, and Samoa.	1 box ferns	Clean.
Mar. 15	China	China and Japan	2 boxes and 1 crate plants.	Clean.
Mar. 20	St. Paul	Mexican ports	2 boxes plants, 2 lots plants.	Part destroyed.
Mar. 23	Belgic	China and Japan	2 lots plants	Clean.
Mar. 27	Australia	Honolulu	1 box plants	Part destroyed.
Apr. 2	Rio de Janeiro ...	China and Japan	20 cases pl'ts, 25 boxes orchids, 4 lots plants.	Part destroyed, others fumigated.
Apr. 6	San Juan	Central America	5 plants	Clean.
Apr. 8	Peru	China and Japan	2 cases plants, 2 lots plants.	Fumigated.
Apr. 11	Alameda	Australia and New Zealand.	5 lots ferns	Clean.
Apr. 16	Colon	Central America	Caladium	Clean.
Apr. 19	Coptic	China and Japan	1 case roots	Clean.
Apr. 21	Australia	Honolulu	3 lots plants	Disinfected.
May 2	Acapulco	Central America	8 orchids	Clean.
May 8	City of Everett ...	Puget Sound	3 sago palms, 3 plants.	Clean.
May 9	Mariposa	Australia, New Zea- land, and Samoa.	6 lots plants	Part destroyed.
May 12	City of Peking ...	China and Japan	5 lots plants	Part destroyed.
May 12	Colima	Central America	6 palms	Clean.
May 23	San Blas	Central America	6 ferns	Clean.
May 26	China	China and Japan	4 cases plants, 6 plants	Fumigated.
June 2	Belgic	China and Japan	2 lots plants	Clean.
June 8	Monowai	Australia, New Zea- land, and Samoa.	3 lots plants	Clean.
June 12	Colon	Central America	Caladium	Clean.
June 13	Peru	China and Japan	1 palm	Clean.
June 24	Coptic	China and Japan	2 lots plants	Clean.
July 1	Australia	Honolulu	5 lots plants	Part destroyed.
July 3	Alameda	Australia and New Zealand.	7 lots plants	Part destroyed.
July 5	City of Rio de Janeiro.	China and Japan	5 lots plants	Part destroyed.
July 12	San José	Central America	2 lots plants	Destroyed.
July 12	Gaelic	China and Japan	2 plants	Clean.
July 17	City of Papeete ...	Tahiti	2 palms	Clean.
July 18	Willamette Valley	Mexican ports	1 lot plants	Destroyed.
July 19	San Blas	Central America	1 box orchids	Clean.
July 25	City of Peking ...	China and Japan	4 lots plants	Part destroyed.
July 27	Australia	Honolulu	5 lots plants	Part destroyed.
July 30	Umatilla	Puget Sound	2 lots plants	Clean.
Aug. 1	China	China and Japan	3 lots plants	Clean.
Aug. 1	Mariposa	Australia, New Zea- land, and Samoa.	6 lots plants	Clean.
Aug. 14	Umatilla	Puget Sound	3 lots plants	Clean.
Aug. 15	Colon	Central America	1 case orchids	Clean.
Aug. 15	Galilee	Tahiti	2 boxes oranges	Destroyed.
Aug. 17	Gaelic	China and Japan	2 lots plants	Part destroyed.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

Date.	Vessel.	From.	Contents.	Disposition.
1896.				
Aug. 21	Australia	Honolulu	2 lots plants	Part destroyed.
Aug. 24	Peru	China and Japan	6 lots plants	Clean.
Aug. 28	Lurline	Hawaii	100 trees—fern trunks.	Clean.
Aug. 28	W. G. Irwin	Hawaii	16 palms	Part destroyed.
Aug. 29	Umatilla	Victoria	Few ferns	Clean.
Aug. 30	Monowai	Australia and New Zealand.	3 cases plants, 2 lots plants.	Part destroyed.
Aug. 31	Coptic	China and Japan	2 lots plants	Clean.
Sept. 3	City of Puebla	Victoria	2 lots ferns	Clean.
Sept. 8	Walla Walla	Victoria	3 lots ferns	Clean.
Sept. 13	Umatilla	Victoria	1 box plants	Clean.
Sept. 14	Willamette Valley	Mexican ports	2 lots plants	Part destroyed.
Sept. 18	City of Puebla	Victoria	1 bouvardia	Clean.
Sept. 19	City of Rio de Janeiro.	China and Japan	9 palms	Clean.
Sept. 21	Gaelic	China and Japan	3 lots plants	Part destroyed.
Sept. 23	Walla Walla	Victoria	2 plants	Clean.
Sept. 26	Alameda	Australia and New Zealand.	1 case plants, 5 lots plants.	Part destroyed, others fumigated.
Oct. 2	City of Peking	China and Japan	4 cases plants, 5 lots plants.	Part destroyed, others fumigated.
Oct. 3	City of Puebla	Victoria	1 box plants	Clean.
Oct. 3	San Juan	Central America	1 plant	Destroyed.
Oct. 4	Jennie Wand	Hawaii	3 lots ferns	Part destroyed.
Oct. 8	Walla Walla	Victoria	2 lots plants	Clean.
Oct. 9	Mary Dodge	Marquesas Islands ..	10 plants	Part destroyed, others dipped.
Oct. 14	China	China and Japan	2 cases plants	Part destroyed.
Oct. 18	City of Puebla	Victoria	1 holly	Clean.
Oct. 19	Willamette Valley ..	Mexican ports	1 lot plants, 505 boxes oranges.	Clean, fumigated.
Oct. 23	Walla Walla	Victoria	2 bundles trees, 2 ferns.	Clean.
Oct. 24	Mariposa	Australia and New Zealand.	3 cases plants, 4 lots plants.	Part destroyed.
Oct. 25	City of Papeete ...	Tahiti	1 box vanilla plts	Clean.
Oct. 26	San José	Central America	4 lots plants	Fumigated.
Oct. 29	Kahului	Hawaii	2 lots plants	Part destroyed.
Oct. 30	Progreso	Central America	1 box plants	Part destroyed.
Nov. 2	City of Puebla	Victoria	Ornamental plts	Clean.
Nov. 2	Peru	China and Japan	22 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Nov. 2	Australia	Honolulu	1 basket palms ..	Clean.
Nov. 7	Columbia	Portland	9 pkgs. black- berry roots.	Clean.
Nov. 10	City of Sydney	Central America	1 box orchids	Clean.
Nov. 12	Umatilla	Victoria	1 bundle plants ..	Clean.
Nov. 13	Coptic	China and Japan		
Nov. 14		Portland	2 bundles roses ..	
Nov. 17	City of Puebla	Victoria	3 plants	Clean.
Nov. 17	Willamette Valley ..	Mexican ports	1 basket ferns, 900 bxs. oranges.	Clean.
Nov. 22	Monowai	Australia and New Zealand.	2 lots plants	Clean.
Nov. 27	Australia	Honolulu	5 lots plants	Part destroyed.
Nov. 29	Gaelic	China and Japan	1 vase plants	Destroyed.
Dec. 8	San Juan	Central America	1,000 seedling coffee, 2 lots.	Clean, part destroyed.
Dec. 13	City of Peking	China and Japan	4 boxes lady- birds for colo- nization.	
Dec. 18	Willamette Valley ..	Mexican ports	2 lots plants (mining scale).	Destroyed.
Dec. 19	Alameda	Australia and New Zealand.	2 lots plants	Clean.
Dec. 23	Australia	Honolulu	1 case plants	Clean.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

Date.	Vessel.	From.	Contents.	Disposition.
1896.				
Jan. 4	Alfridi	China and Japan ...	589 bxs. oranges.	Clean.
Jan. 11	Peru	China and Japan ...	189 cases plants, 6 bxs. pomelo.	Part destroyed, others fumigated.
Jan. 14	Australia	Honolulu	2 lots plants ...	Part destroyed.
Jan. 16	Willamette Valley	Mexican ports	4 lots plants ...	Part destroyed.
Jan. 16	Mariposa	Australia and New Zealand.	3 palms	Destroyed.
Jan. 21	Coptic	China and Japan ...	17 cases plants, 3 lots plants.	Part destroyed, others fumigated.
Jan. 31	City of Rio de Janeiro.	China and Japan ...	64 cases plants, 2 lots plants.	Part destroyed, others fumigated.
Feb. 7	Gaelic	China and Japan ...	84 cases plants, 1 lot plants.	Part destroyed, others fumigated.
Feb. 9	Australia	Honolulu	1 case fern trunks, 4 lots plants.	Clean.
Feb. 11	Zealandia	Central America ...	2 palms	Part destroyed.
Feb. 12	San Juan	Central America ...	3 plants	Destroyed.
Feb. 16	Monowai	Australia and New Zealand.	2 lots plants ...	Clean.
Feb. 18	City of Peking ...	China and Japan ...	44 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Feb. 19	Willamette Valley	Mexican ports	6 palms, 250 boxes tomatoes.	Clean.
Feb. 23	San José	Central America ...	2 lots plants ...	Clean.
Feb. 27	Belgic	China and Japan ...	28 cases plants, 1 lot plants.	Part destroyed, others fumigated.
Mar. 5	Australia	Honolulu	2 lots plants ...	Part destroyed.
Mar. 5	China	China and Japan ...	6 crates plants, 2 lots plants ...	Fumigated. Clean.
Mar. 11	Umatilla	Victoria	1 raphis	Clean.
Mar. 12	Alameda	Australia and New Zealand.	17 pkgs. tree fern trunks.	Clean.
Mar. 13	Kahului	Hawaii	9 lots plants ...	Part destroyed.
Mar. 19	City of Sydney ...	Central America ...	2 lots plants ...	Part destroyed.
Mar. 20	Peru	China and Japan ...	1 pkg. orchids ...	Clean.
Mar. 25	Central America ...	17 cases plants, 4 lots plants ...	Fumigated. Clean.
Mar. 27	Coptic	China and Japan ...	1 pkg. orchids ...	Part destroyed.
Mar. 28	Australia	Honolulu	17 cases plants, 15 cases sago stems.	Eastern States. Clean.
Mar. 31	City of Puebla ...	Victoria	260 pkgs. pine-apple plants, 5 lots plants ...	For Florida. Part destroyed.
Mar. 31	Willamette Valley	Mexican ports	2 lots plants ...	Clean.
Apr. 9	City of Rio de Janeiro.	China and Japan ...	4 lots plants ...	Part destroyed.
Apr. 9	Mariposa	Australia and New Zealand.	2 lots plants ...	Clean.
Apr. 13	San Blas	Central America ...	3 cases tree fern trunks, 5 lots plants.	Clean.
Apr. 19	Gaelic	China and Japan ...	1 pkg. plants ...	Part destroyed.
Apr. 20	Zealandia	Central America ...	12 cases plants, pair mungoose	Clean.
Apr. 22	Santiago	Hawaii	1 medicinal plt.	Fumigated.
Apr. 23	Australia	Honolulu	12 ferns	Killed.
Apr. 24	City of Peking ...	China and Japan ...	7 lots plants ...	Clean.
Apr. 25	San Juan	Panama	1 case plants, 1 case filbert plts frm Italy.	Part destroyed, others disinfected.
Apr. 28	Orizaba	Mexican ports	1 case plants ...	Plants dead.
Apr. 30	City of Puebla ...	Victoria	3 lots plants ...	Part destroyed.
May 1	Doric	China and Japan ...	2 lots plants ...	Clean.
May 3	Colon	Central America ...	4 cases plants, 1 lot plants ...	Fumigated. Clean.
May 9	Monowai	Australia and New Zealand.	2 lots plants ...	"Mining scale," destroyed.
May 12	China	China and Japan ...	1 box ferns ...	Destroyed.
			1 case plants, 4 sago palms...	Eastern States. Clean.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

Date.	Vessel.	From.	Contents.	Disposition.
1896.				
May 16	City of Sydney	Central America	3 lots plants	Part destroyed.
May 16	Australia	Honolulu	4 boxes pineap- ple plants.	For Florida.
May 20	Walla Walla	Victoria	3 lots plants	Part destroyed.
May 20	Belgie	China and Japan	1 plant 3 crates plants.	Clean. Part destroyed.
May 28	Orizaba	Mexican ports	3 lots plants	Clean.
May 28	San Blas	Central America	5 lemon trees	Destroyed.
June 4	Walla Walla	Victoria	1 caladium	Clean.
June 4	Alameda	Australia and New Zealand.	2 lots plants 326 boxes apples.	Clean. Fumigated (scale).
June 5	Peru	China and Japan	6 lots plants	Part destroyed.
June 10	Australia	Honolulu	4 cases plants, 5 lots plants.	Disinfected.
June 12	Coos Bay	Mexican ports	41 bundles tree fern trunk.	Clean.
June 12	Acapulco	Central America	2 palms	Clean.
June 14	City of Puebla	Victoria	6 plants	Clean.
June 14	City of Para	Central America	1 bundle plants.	Clean.
June 16	Coptic	China and Japan	4 palms	Destroyed.
June 18	Newport	Valparaiso	4 lots plants	Clean.
June 19	Walla Walla	Victoria	1,000 sks waln'ts 100 boxes of Aus- tralian apples.	Owners refused to fu- migate; sent them back.
June 20	City of Rio de Ja- neiro.	China and Japan	2 lots plants	Clean.
June 26	Kahului	Hawaii	4 plants	Destroyed.
June 27	Orizaba	Mexican ports	3 lots plants	Clean.
June 29	City of Puebla	Victoria	1 sack dried fruit	Destroyed.
July 2	Mariposa and New Zealand.	Australia	1 fern	Clean.
July 4	Walla Walla	Victoria	2 lots plants	Part destroyed.
July 5	City of Peking	China and Japan	1 basket plants	Clean.
July 6	Australia	Honolulu	6 lots plants 6 lots plants 20 sacks pineap- ple plants.	Part destroyed. Part destroyed. For Florida.
July 12	Doric	China and Japan	3 lots plants	Clean.
July 15	Wrecked Colum- bia, portug Active	Central America	Lot of orchids and ferns.	Clean.
July 19	China	China and Japan	3 lots plants	Clean.
July 24	Umatilla	Victoria	1 box ferns	Clean.
July 25	Orizaba	Mexican ports	Several plants	Part destroyed.
July 28	Australia	Honolulu	1 lot plants	Clean.
July 29	City of Puebla	Victoria	7 raspberry pl'ts.	Clean.
July 29	Mexico		1 lot ferns	Clean.
July 30	San Blas	Central America	1 plant	Clean.
July 30	Monowai	Australia and New Zealand.	4 plants	Clean.
Aug. 8	Umatilla	Victoria	3 lots plants	Clean.
Aug. 9	Peru	China and Japan	4 lots plants	Part destroyed.
Aug. 13	City of Puebla	Victoria	2 boxes ferns	Clean.
Aug. 13	Coptic	China and Japan	4 lots plants	Clean.
Aug. 16	City of Para	Central America	Coffee branches with berries.	Clean.
Aug. 18	Walla Walla	Victoria	1 box plants from Alaska.	Clean.
Aug. 21	Orizaba	Mexican ports	4 boxes cactus 6 plants	Clean. Destroyed.
Aug. 22	Australia	Honolulu	245 sks. pineap- ple plants.	For Florida.
Aug. 24	Acapulco	Central America	7 lots plants	Part destroyed.
Aug. 24	Galilee	Tahiti	2 lots plants	Destroyed.
Aug. 27	Alameda	Australia and New Zealand.	1 plant 4 cases araucaria.	Clean.
Aug. 29	City of Rio de Ja- neiro.	China and Japan	4 lots plants 3 lots plants	Clean.



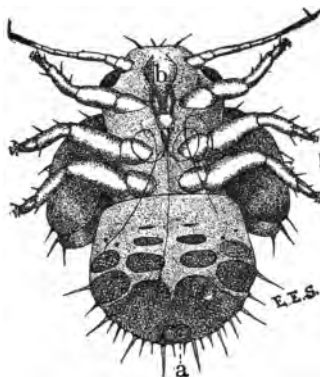
1—The small curved cases in which the cigar-case bearer caterpillars hibernate on the twigs; the upper part of the figure is natural size, while the two lower twigs are twice natural size.



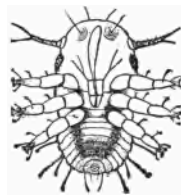
6—A cigar-case bearer attached to a young pear which it had killed; natural size.



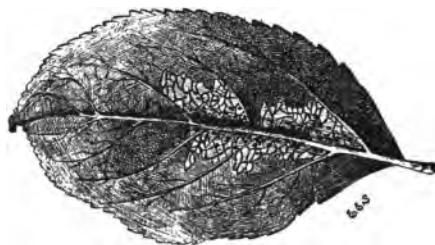
9—The bud moth—the adult insect, twice natural size.



2—Full-grown nymph of the pear psylla, ventral view, greatly enlarged.



3—Newly hatched nymph of pear psylla, ventral view, greatly enlarged. (Reduced from figure by U. S. Dept. of Agri.)



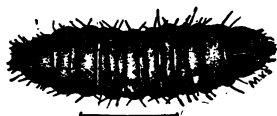
4—Leaf showing the work of a young caterpillar of bud moth during the summer.



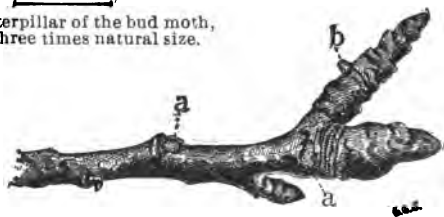
5—Cigar-case bearer—adult insect, about four times natural size.



7—*Psylla pyricola*, the adult insect, much enlarged.



8—Caterpillar of the bud moth, about three times natural size.



10—Twig showing the position of the winter homes of the caterpillar of cigar-case bearer at a, a, and b, natural size.



1—Cigar-case bearers at work; natural size.



2—A cigar-case bearer caterpillar feeding; much enlarged.

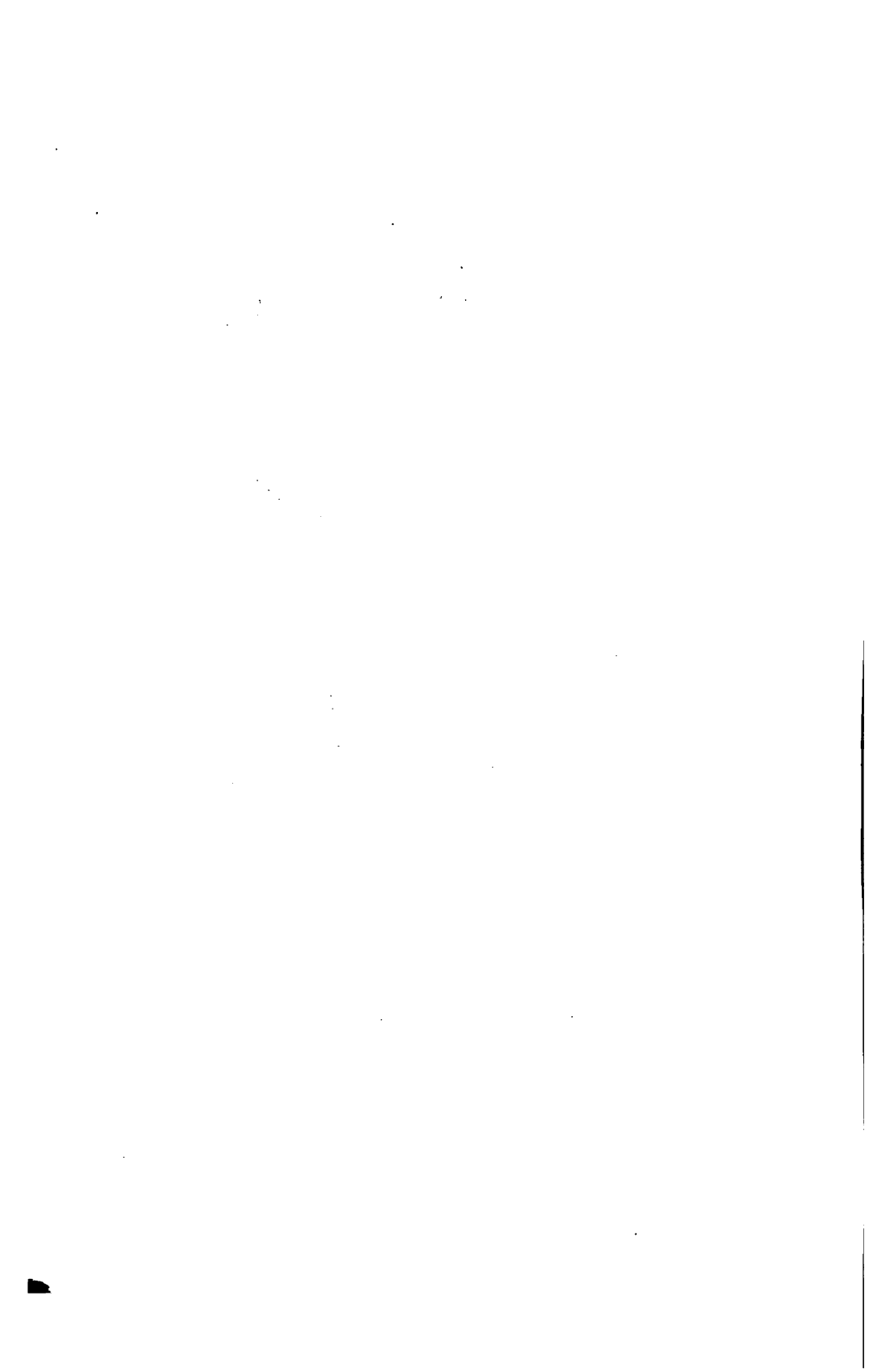


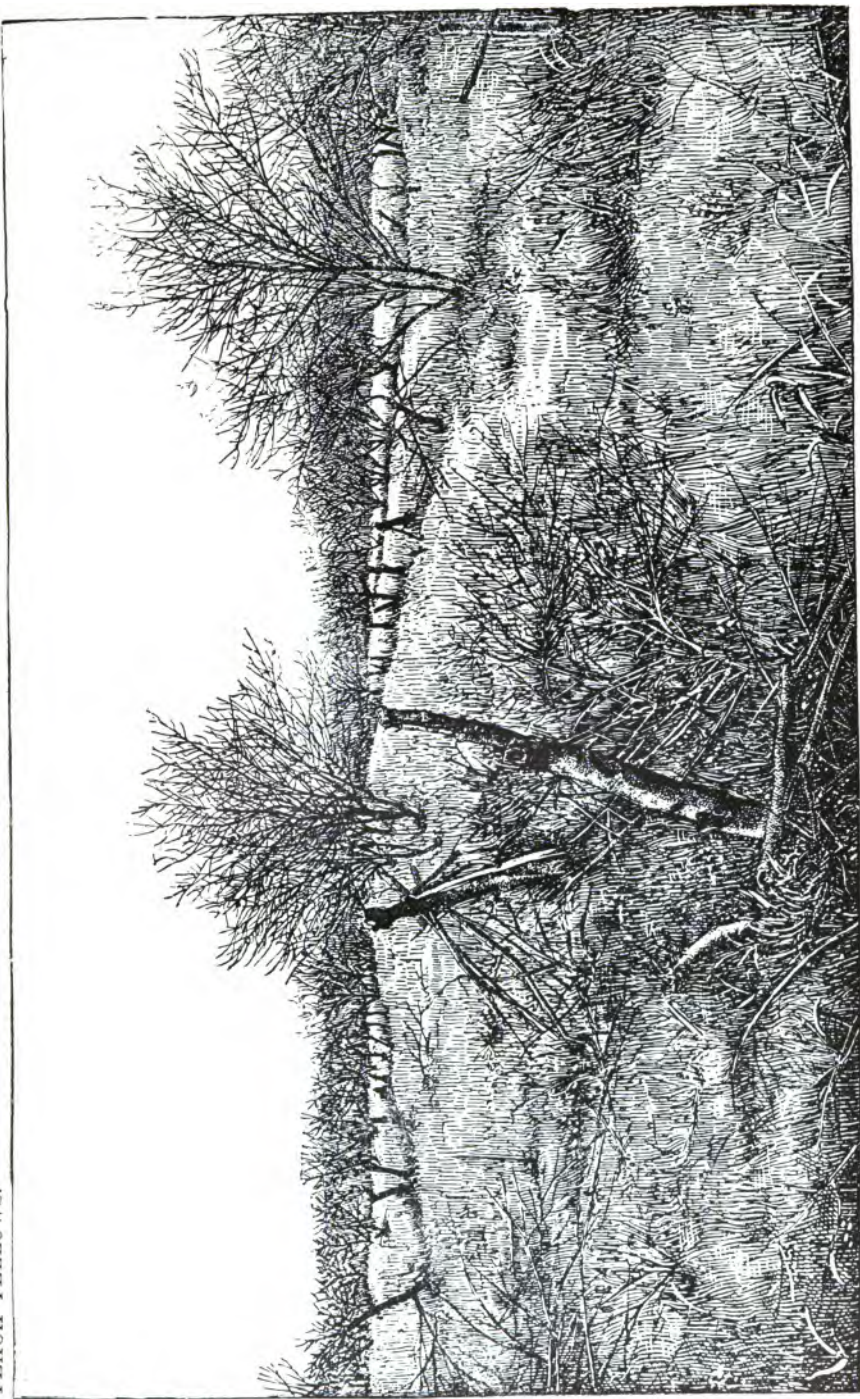
3—Characteristic work of the cigar-case bearer caterpillars on the leaves; natural size.



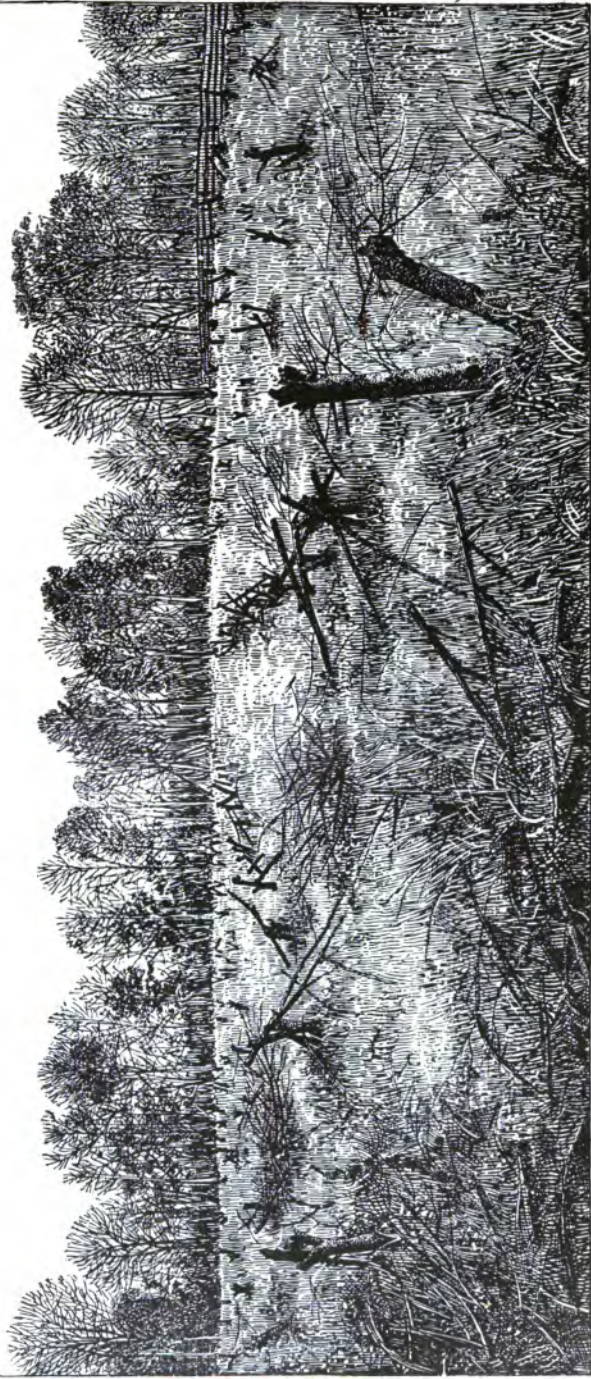
CUTTING AND BURNING WOODS INFESTED WITH THE GYPSY MOTH.

From a photograph taken by the State Board of Agriculture of Massachusetts, in Woburn, in December, 1895.





SCENE—MARYLAND ORCHARD RUINED BY "PEACH YELLOWS."
Reproduced from a photograph taken by the Division of Vegetable Pathology of the Department of Agriculture, Washington, D. C.



SCENE—MARYLAND ORCHARD RUINED BY "PEACH YELLOWS."
Reproduced from a photograph taken by the Division of Vegetable Pathology of the Department of Agriculture, Washington, D. C.

VIII.

INJURIOUS INSECT PESTS FOUND ON TREES AND PLANTS
FROM FOREIGN COUNTRIES.

By ALEXANDER CRAW, Entomologist and Quarantine Officer of this Board.

The following descriptions are of insect pests found on trees and plants from foreign countries. To every reader of this report the great necessity of a most rigid inspection to keep them out will be apparent. Should they become established in our State, no one can foretell the misfortune that would be sure to follow:

WHITE-POINTED ASPIDIOTUS.

Aspidiotus albopunctatus, Cockerell.

(Plate VIII, Fig. 9.)

New scale found on orange trees from Japan.

"Male scale is very small, hardly over $\frac{1}{2}$ mm., broad, circular, becoming at length elongate by the production of one side, and then over 1 mm. long, slightly convex, dull black, inclining to grayish; exuviae marked by a white dot surrounded by a black ring. Removed from the bark, the scale leaves a white patch without any dark ring.

"Female scale circular, flat, extremely inconspicuous, dull pale ochereous, more or less blackish; on examining the scale from beneath it is seen that the exuviae are large and orange. Probably the few female scales seen are not quite adult. Their diameter is about 1 mm.

"Adult Female.—Pale yellow, of ordinary circular shape; pygidial area striated, no groups of ventral glands. Two pairs of lobes only; median lobes large, close together, but not touching, rounded, notched on the outer side and sometimes slightly on the inner; second lobes much smaller, strongly notched on the outer side. Plates spine-like, not very large. Beyond the lobes the margin appears to present three or four irregular serrations, which in well-developed specimens take the form of double spine-like plates. There are two pairs of sac-like incisions, as in *perniciosus*."

This scale closely resembles *Aspidiotus perniciosus*, Comstock, but the male scales of the latter have the exuviae more or less yellowish. The fact that *perniciosus* does not attack citrus trees, and this species was found plentifully upon the stems and branches of seedling orange trees (*trifoliata*) from Japan, convinced me that it was a new species, so I submitted it to Professor Cockerell, and he pronounced it so, and named it as above. The trees were destroyed.

DUPLEX SCALE.

Aspidiotus duplex, Cockerell.

(Plate VIII, Fig. 11.)

This is a Japanese scale, and appears to be a general feeder. I have found it upon the following trees and plants: Orange, camellia, azalea, *Olea fragrans*, tea, camphor, peony, *Myrica rubra*, and rhododendron.

The female scale is about $2\frac{3}{4}$ mm. diameter, subcircular, moderately convex, dark blackish-brown, with the large round exuviae nearly to one side, and orange in color. Removed from the bark a white patch is left. When upon the stems and larger twigs of the camellia the scale has the same brown color of the bark and is difficult to detect. This scale suc-

cumbs readily to fumigation with hydrocyanic acid gas. It locates upon the leaves, twigs, and fruit of the orange.

Description of the Female.—"Pale orange, broadly oval or subcircular, with the large cephalic portion separated from the rest by a deep suture. Mouth parts large; skin on dorsum very strongly, transversely grooved, the grooves linear, often anastomosing. Four groups of ventral glands in the usual situation; caudolaterals of 28 to 30, cephalaterals of 42; median group represented by two orifices, not very close to each other. Besides these groups there is a group of 17 to 22 orifices, quite similar in character, on each side of the mouth parts; these groups are oval in outline. The anus is about on a level with the anterior ends of the caudolateral groups. There are four (two on each side) long tubes or ducts originating about the region between the caudolateral groups and the anus, and passing hindward, practically parallel, to the end of the body. On the dorsal surfaces the segments are marked by rows of oval pores. The 'pygidium' shows on the dorsal surface a very distinct lattice-work, as in *A. theæ* and *Technaspis filiformis*. Median lobes very large, brown, rounded at the ends, but notched on each side so as to be trilobed; the lateral lobes very small and passing into the straight parallel sides. The median lobes are very close together, but distinctly separated, not touching, not diverging. There are three other pairs of lobes, small, narrow, rounded at ends, very inconspicuous and easily overlooked among the scale-like plates. Plates not extending beyond lobes, scale-like, not separately distinguishable, but forming a continuous fringe, which rapidly narrows beyond the fourth lobe, and ceases before the deep notch which indicates another segment. Margin cephalad of fourth lobe distinctly serrate, serrations coarse."

FLORIDA RED SCALE.

Aspidiotus ficus, Ashmead.

(Plate VIII, Fig. 2.)

This is a widely distributed species of scale, but so far it has not yet been found in the orchards of this State. The following kinds of trees and plants infested with this destructive pest have been received: Citrus trees from Florida and China; palms from Cuba; *Ilex latifolia* and *Aspidistra lurida* from Japan. It is reported to occur at Khandallah, India, upon orange, also upon various plants in New South Wales, Australia. It has also been found on orange, and on the stems of rose bushes at Vera Cruz, Mexico.

Prof. C. H. Tyler Townsend, in his report of his trip to investigate insects of economic importance in Mexico, for the Division of Entomology, Washington, D. C., says of this species: "Very bad on fruit and leaves of orange in plaza in Tampico; also very bad on tangerine orange in Tampico. Also bad on orange in Matamoras and Chihuahua on leaves of a tree called 'palo dulce.'"

"The scale of the female is circular, with exuviae nearly central; the position of the first skin is indicated by a nipple-like prominence which, in fresh specimens, is white. The part of the scale covering the second skin is light reddish-brown. The remainder of the scale is much darker, varying from a dark reddish-brown to black, excepting the thin part of the margin, which is gray. When full grown the scale measures 2 mm. in diameter."

ROSS' ASPIDIOTUS.

Aspidiotus rossii, Maskell.

(Plate VIII, Fig. 4.)

This scale closely resembles *Aspidiotus ficus*, but is coal black in color and much larger. It is occasionally found upon such plants as palms, acacias, and *Araucaria bidwillii* received from Australia, also on palms from Samoa. So far it has not been found upon citrus or other fruit trees, but without doubt it will attack the orange and lemon; besides injuring the

growth of the trees would also, from its color, destroy the market value and appearance of the fruit. As seen with the naked eye it appears to be jet black, but upon examination with a good lens the exuviae show two faint brown rings in the adult female; the half-grown scale appears to have but one. The exuviae are slightly to one side of the center. The male scale is oblong and smaller. In the illustration the scale is lighter, and the exuviae more conspicuous than in the natural state.

Aspidiotus sphærioides, Cockerell.

(Plate VIII, Fig. 6.)

This scale is from Louisiana, infesting ornamental plants having long *cordylina*-like leaves. The female scale resembles *A. ficus*, but is smaller and more convex; the exuviae are nearly central. It adheres very firmly to the leaves.

The genus *Aspidiotus* are generally indiscriminate feeders, and should this one attack fruit trees it would probably prove a serious pest, as it is very prolific.

Aspidiotus sp.

(Plate VIII, Fig. 13.)

A large brown *Aspidiotus* found upon ornamental plants from Ensenada, Mexico. They collect in clusters like *Aspidiotus rapax*, but are larger.

Chionaspis aspidistræ, Signoret.

(Plate VII, Fig. 14.)

The female of this species is a small brown scale occasionally found upon *Aspidistra lurida*, from Japan. The white carinated males predominate, and are very conspicuous.

Chionaspis assimilis, Maskell.

(Plate VIII, Fig. 3.)

This is an Australian species attacking a species of eucalyptus or acacia.

"Female scale elongated, pyriform, slightly curved; color, dark brown; the pellicles at one end yellow; length, about $\frac{1}{16}$ inch.

"Male scale brownish-white, narrow, semi-cylindrical; pellicle yellow; length, $\frac{1}{16}$ inch.

"Adult female, of the usual elongate form of the genus, the cephalic region smooth, the abdomen with conspicuous segments; color, brown; length, about $\frac{1}{16}$ inch. The abdomen ends in two median lobes, with at each side a few spines; pygidium exhibiting five groups of spinnerets, but only two or three in each group.

"The larva is of the normal form of the Diaspid group, but the rostrum appears to be abnormally large."

MINING SCALE.

Chionaspis biclavis, Comstock.

A. ON ORANGE.—(Plate VII, Fig. 5; also Plate VIII, Figs. 7 and 8.)

Specimen twig taken from a cargo of 325,000 orange trees that arrived at San Pedro from Tahiti on June 15, 1891. The trees were fumigated five times, with double and treble strength hydrocyanic acid gas, and dipped twice in a strong caustic solution, with the result that the trees

were injured, but sufficient scales survived to justify legal proceedings being instituted against the trees as a nuisance. After two lengthy trials the court decided against the importers, and the trees were burned.

Professor Comstock described this species in 1883. One of his illustrations represents the scale upon a fig leaf, and clearly shows its mining habits, the dermal layer of the leaf with its hairs being continuous over the surface of the scale. The scales upon the orange trees from Tahiti were located under the outer skin or epidermis, and the marking or faint stripes of the bark were well defined over the scale; the latter would be difficult to detect were it not for the swelling where located upon the stem or branch. The following is Professor Comstock's description:

"The scale of the female is very nearly circular; the exuviae are marginal, and project beyond the edge of the scale.

"*Female*.—The characters presented by the last segment of the female are as unusual as those presented by the scale. The pores on the dorsal surface of the segment are very small. Scattered over the ventral surface are numerous minute spines. The groups of spinnerets are wanting. The mesal lobes are large, oblique, nearly twice as broad as long; approximate at the base; the mesal margins diverge slightly, distal margin ser-

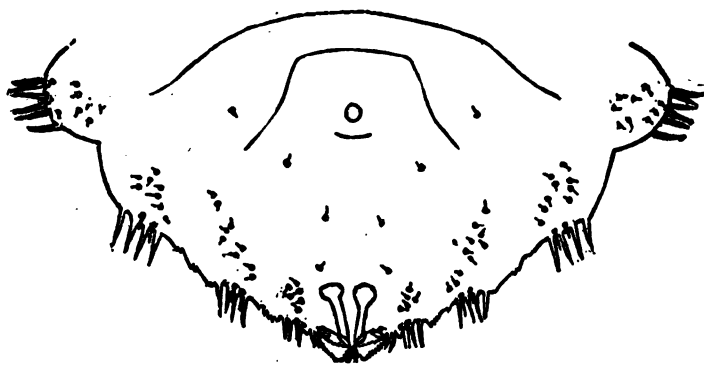


Fig. 2.

rate; mesa distal angle rounded and produced into a lobule. The second lobe is very small, being simply an angular projection of the body wall. The third lobe is about three times as wide as the second lobe; but it projects only a little beyond the margin of the segment. The plates are simple and spine-like. There are two minute ones between lobes; two between first and second lobes; two or three between second and third lobes; a group of three or four larger ones laterad of third lobe; and another group of four or five still larger ones about midway between this group and the penultimate segment. Each of the three segments preceding the last bears on each lateral margin about seven plates.

"Two spines accompany each group of plates, one on the dorsal surface and one on the ventral. The first and second spines of each side are very small; the third, which is between the second and third lobes, is the largest; the fourth and fifth are successively smaller.

"There are two conspicuous club-shaped organs which appear like thickenings of the body wall, but which are really within the body cephalad of the mesal lobes. These organs are about three times the length of the mesal lobes; they converge caudad, and the cephalic end of each is suddenly enlarged. This species may be distinguished from any other known American coccid by the presence of these organs."

Fig. 2 (after Comstock) represents the last segment of the female, as seen under the microscope, showing the *club-shaped organs* peculiar to this species.

On September 22, 1896, the American barkentine "Tropic Bird" arrived from Tahiti. A passenger brought six coffee trees infested with the "mining scale." The scales were under the thin outer bark, but even

in such an apparently secure location a very large percentage of the scales were destroyed by an internal chalcid parasite. There were no indications of parasites having attacked any of the scales infesting the orange trees that arrived from the same place in 1891.

B. ON GUAVA.—(Plate VIII, Fig. 7, Guava; Fig. 8, Gardenia; Plate VII, Fig. 5, Orange.)

On January 16, 1896, the steamship "Willamette Valley" arrived from Mexican ports. A lady passenger had ten Mexican guava plants that were infested with this serious scale pest, so they were destroyed. Citrus trees from Tahiti and southern Mexico, also gardenias and guavas from three districts in the latter country, would indicate that this scale is becoming widely distributed and is not confined to one food plant; therefore, the danger of its introduction is great.

Mr. Maskell records a new variety (*C. detecta*, Maskell) of this species, found upon shade trees in the Sandwich Islands. The difference between this and Professor Comstock's species consists only in the fact that the Sandwich Islands scale does not burrow, but lies exposed on the bark. This is very poor ground upon which to erect even a variety. The name of the tree upon which it was found is not given; the probability is, however, that the outer bark or epidermis was of such a character as to prevent the mining habits of this species.

On May 3, 1896, a passenger from Soconusco, Mexico, per the steamship "Colon," brought three cuttings of gardenia. They were found to be infested with the "mining scale." A cabinet specimen was saved, and the others were destroyed. The passenger stated that his gardenia bushes, which formerly were vigorous and profuse bloomers, were now dying, and he could not account for it.

CHINESE CHIONASPIS.

Chionaspis chinensis, Cockerell.

(Plate VII, Fig. 3.)

This is a new species of scale found upon some *Quercus* that arrived from China, May 20, 1896. The trees were destroyed. The following is Prof. Theo. D. A. Cockerell's technical description, to whom I referred the species:

"*Female Scale*.— $2\frac{3}{4}$ mm. long, $1\frac{1}{8}$ broad, snow-white, broad, flat; exuviae clear orange, second skin $\frac{3}{4}$ mm. long.

"*Female*.—Median lobes brownish, wide apart, even at the base, diverging, low, little produced, the long inner margin crenate. Second and third lobes each represented by a pair of rounded lobules, of which the mesad is the larger. Between the lobes are long spine-like plates. Mesad of each lobule, at its base, is a very short saccular gland. A pair of these glands marks the place of the fourth lobe, which, however, is entirely obsolete, leaving the margin slightly crenate at that place. Cephalad of this is on the margin a spine, and further on a large spine-like plate, and still further a group of four large spine-like plates. The obsolete segments are marked by conspicuous rows of transversely elongate glands. Five groups of ventral glands, the lateral groups nearly touching. Median group of 9, cephalaterals 17, caudolaterals about 25. Lateral margins of segments rounded, not much produced.

"*Male Scale*.—Small, ordinary, white, with no distinct keel; not fluffy; exuviae orange."

"Allied to *C. nyssæ*, and especially to *C. eugeniæ*. The species *nyssæ*, *chinensis*, and *eugeniæ*, though so widely separated geographically, form a natural group of the genus."

ORANGE CHIONASPIS.

Chionaspis citri, Comstock.

(Plate VII, Fig. 11.)

This injurious scale has been found upon orange trees from Australia, and upon other plants from Japan and the South Sea Islands. The male scales are light colored and very conspicuous.

"The female is a dirty dark brown with a gray margin. The exuviae are brownish-yellow. There is a central ridge from which the sides of the scale slope like the roof of a house. The greater prominence of this ridge and the more elongated form of the scale, are the principal differences between this scale and that of the females of *Chionaspis euonymi*."

So far this scale has not been reported as having been found established in this State.

NEW SCALE INSECT.

Chionaspis difficilis, Cockerell.

(Plate VII, Fig. 8.)

This scale was found upon nursery stock (*Eleagnus*) imported into San Francisco from Japan, and destroyed.

"The female scale about 2 mm. long, irregular, from round to subelongate, slightly woolly in texture, white, moderately convex; exuviae to one side, rather inconspicuous; second skin black or nearly so; first skin pale straw color, about one-third on second, but on the side toward the middle of the scales sometimes the exuviae are reddish. Removed from the twig this scale leaves a very conspicuous snow-white patch.

"The male scale is white, tricarinate, exuviae almost colorless.

"Adult female when removed from the scale is plump, orange rufous, with a slight purple tinge.

"The female scale differs from *amygdali* in the color of the exuviae, and the male scale is quite distinct, being well tricarinate."

EUONYMUS SCALE.

Chionaspis euonymi, Comstock.

(Plate VII, Fig. 9.)

A shipment of *Euonymus latifolius argenteus variegatus* from Japan was so seriously infested with this pest that on portions of the stems and twigs the bark was invisible. The leaves appear to be a favorite location for the narrow, white, carinated male scales. This species very closely resembles the "orange Chionaspis" (Plate VII, Fig. 11). It is also occasionally found upon the golden variegated euonymus. This scale was found on euonymus at Norfolk, Va., but it is probably a Japanese species, as the above varieties of *euonymi* are natives of Japan.

ALMOND SCALE.

Diaspis amygdali, Cockerell.

(Plate VIII, Fig. 12, walnut; Plate VII, Fig. 2, plum.)

This scale very closely resembles the destructive *Diaspis lanatus*, and is as much to be feared. Great quantities of plum, persimmon, peach, cherry, and walnut trees infested with this scale have been received from Japan, and destroyed.

Japanese-grown trees infested with this scale have also been received in San Francisco that came by way of Seattle, Washington, and via Sydney, Australia. There is no question about the origin of the last-mentioned lot, as the Japanese graft more clumsily, using larger stocks and a different method to nurserymen in other countries.

The female scale is not very conspicuous, of a dirty gray, with a reddish-brown exuviae to one side. When the scale is removed from the branch it leaves a white ventral scale attached to the bark.

Plum trees were received that had the stems under the surface of the ground, and some of the surface roots slightly infested with this scale, resembling in this respect the "rose scale" (*Aulacaspis rosæ*).

A NEW PEACH, CHERRY, AND PLUM SCALE.

Diaspis lanatus, Morgan & Cockerell.

(Plate VIII, Fig. 1.)

This scale has been found upon cherry, peach, and plum trees from Japan.

Experiments conducted by the entomological department at Washington, D. C., with the strongest and best known insecticides, demonstrated the fact that this is one of the most difficult to kill, as well as one of the most pernicious scales known.

Prof. L. O. Howard mentions the following places and varieties of plants upon which it is found: "In the District of Columbia it is found only upon peach. In Florida and Georgia it has been found upon peach and plum. In Ceylon it occurs upon geranium; in Jamaica upon grape, bastard cedar (*Guazuma ulmifolia*), *Cycas media*, *Capsicum*, *Argyrea speciosa*, the bark and twigs of an undetermined malvaceous plant, *Bryophyllum calycinum*, peach, pelargonium, jasminum, stems of cotton, *Colotropis procera*, and *Hibiscus esculentus*."

"The scale of the adult female is gray in color, and is not readily distinguished. It occurs abundantly upon larger twigs than is customary with other scale insects, and frequently appears to be almost covered by the outer bark of the twig. The males have a white scale, as a rule, cluster on the lower parts of the branches of young trees and at the base of the trunk. Where the insect is abundant, the trees frequently appear as if whitewashed, from the masses of these male scales."

Diaspis patelliformis? Sasak.

(Plate VII, Fig. 1.)

This scale is from Honolulu, and resembles the rose scale (*Aulacaspis rosæ*).

CAMELLIA FIORINIA.

Fiorinia camelliae, Comstock.

(Plate VII, Fig. 6.)

This is a very widely distributed species; and is a very serious scale upon palm trees and camellias; the leaves become yellow and wither up or drop. It has been found on plants from Belgium, Australia, Sandwich Islands, Japan, and the Eastern States; it also infests cocoanut palms in Jamaica. Frequently it is found in hothouses in this State. It is a very inconspicuous species.

The scale of the female is yellowish-brown, with the larval skin yellow, and a thin margin of the remainder of the scale white. That part of the scale which covers the second skin has a prominent longitudinal, central ridge, which is dark brown; the sides of the scale sloping from the ridge are more or less wrinkled. The full-grown female removed from the scale is a pale yellowish-brown color, with large irregular lemon-yellow spots. The scale of the male is similar to that of the female, but smaller.

THREAD-LIKE SCALE.

Ischnaspis filiformis, Douglass.

(Plate VII, Fig. 4.)

This is a long, narrow, black scale, resembling closely a *Mytilaspis*, found upon a variegated *Pandanus* from Japan. It is reported as occurring in extraordinary numbers on *Cycas revoluta* at Trinidad, West Indies. It was received at Wellington, New Zealand, from Adelaide, South Australia, where they were plentiful upon palms in hothouses.

KEELED MYTILASPIS.

Mytilaspis carinata, Cockerell.

(Plate VII, Fig. 12.)

This is a new species, found upon wide-leaved plants from Acapulco. It slightly resembles the purple scale (*M. citricola*), but differs in having a narrower and distinctly carinated scale.

"Female scale, $3\frac{1}{4}$ mm. long; second skin about 1 mm., first skin about $\frac{1}{4}$ mm., about one half on first; width of scale, $\frac{3}{4}$ mm. Scale pale brown (in dry specimens they become very dark), strongly keeled, almost exactly straight. Narrow, not shining; exuviae dull orange. Male scale similar but smaller, with only one pellicle."

PURPLE SCALE.

Mytilaspis citricola, Packard.

(Plate VII, Fig. 7.)

This destructive scale is very widely distributed, for the specimen shown on plate was taken from lime trees brought from Guatemala, and destroyed. It is found in the orange and lemon districts of Europe, the West Indies, Florida, and Tahiti. It was noticed this year for the first time from Central America. This scale was unfortunately introduced upon orange trees from Florida that were planted a few years ago without fumigation, and it has got a very strong foothold in San Diego County, where all means should be employed to eradicate it.

NEW MYTILASPIS.

Mytilaspis crawii, Cockerell.

(Plate VII, Fig. 13.)

This is a new scale, and one of the smallest of this destructive family of scale insects. Its mining habits and size make it extremely difficult to detect. It lives beneath the epidermis, on the underside of the leaf of *Quercus cuspidatus*, and a species of *Eleagnus* from Japan.

"The female scale is narrow, measures $2\frac{1}{2}$ mm. long and $\frac{1}{2}$ mm. wide; pale orange yellow; exuviae concolorous.

"Adult female yellow, four groups of ventral glands, caudolaterals of 3, cephalaterals of 4 in a row. Median lobes very large, roundish at the ends, their edges finely serrate. They are closely adjacent at a point at the base, being separated, however, by a pair of small spine-like plates; thence they diverge at nearly a right angle to their rounded ends; thence rapidly sloping, the outward slope longer than the inner, and diverging from it at an angle of about 80° . Next to the outer side of each median lobe is a small spine-like plate, then a sac-like incision, then the small second lobe, shaped much like the last joint of a finger, and in bulk hardly one tenth of a median lobe. Following this is a small sac-like incision, then a pointed projection, then two succular incisions, then after a short interval a spine-like plate, then another sac-like incision, then a long interval of smooth margin, then another sac, then another interval, in the middle of which is a small spine. Below the sac-like incisions are transversely elongate pores."

"The scale is extremely inconspicuous, as it lives beneath the epidermis, on the under side of the leaf, along the mid-rib. By this habit, and the large median lobes, it will be readily distinguished. From *M. grandilobus*, Maskell, which has the large median lobes, it is known by the entirely different color of the scale, etc. Several of the specimens were parasitized."

LONG SCALE.

Mytilaspis gloverii, Packard.

(Plate VIII, Fig. 14.)

This is the destructive scale of the orange, and was found upon some deciduous ornamental plants from Japan. Citrus trees from the same country are also occasionally found infested with the same scale, also ornamental plants from the Sandwich Islands, and orange and lime trees and palms (*Pritchardia filimentosa*) from Baja California, Mexico.

This scale was also unfortunately brought from Florida upon orange trees shipped into San Diego County, right in the heart of the best lemon district. The trees arrived at the same time as those referred to on page 95 of the Fourth Biennial Report of this Board. No expense should be spared in stamping this pest out of the State.

PERGANDE'S CHAFF SCALE.

Parlatoria pergandei, Comstock.

(Plate VIII, Fig. 5.)

Citrus trees from Florida were frequently found infested with this inconspicuous scale, but it succumbs readily to fumigation with hydrocyanic acid gas.

Thousands of orange trees from Florida have been planted in the southern and central counties, but were thoroughly gased before they were set out, and so far it has not been reported as occurring in the State. This scale is quite common in Florida, and decidedly more diffi-

cult to kill with washes than either the "purple" or "long." Hydrocyanic acid gas is used effectively in destroying this scale.

When located upon the gray bark of orange trees it resembles the bark, but is more conspicuous upon the leaves. The female scale is light-colored, nearly circular, with the exuviae at the edge, giving it a slightly pointed appearance. The male scale is white with a darker larval skin, very small and narrow.

NEW SCALE.

Parlatoria theæ, var. *viridis*, Cockerell.

(Plate VII, Fig. 10.)

This scale was found upon ornamental plants from Japan.

"The female scale is about $1\frac{1}{2}$ mm. long, nearly circular, but the exuviae projecting at one side give it a broad, pyriform outline. From one third to two thirds of the first skin overlaps the second. First skin, dark green to greenish-black. Second skin, about twice as long as first, nearly round, dark greenish to black, with sometimes a narrow brown margin. Scale very little convex, white, with a more or less pronounced grayish-yellow tinge. Removed from the bark it leaves a white mark."

In regard to this scale, Professor Cockerell says:

"The species of *Parlatoria* are not easy to define, and I really do not know whether, in the present case, we have to do with a valid species or a variety of *theæ*; at any rate, *viridis* may be known by the more produced tips of the median lobes, the median plates as long as those between the first and second lobes, the bright green color, the five groups of ventral glands, and the pale flattened scale. In *viridis*, the lateral groups of glands almost or quite touch each other, while in *theæ* they are well apart. From Maskell's species, *myrtus* and *pittospori*, *viridis* differs at once by the plates being not longer than the lobes. From Del Guercio's *P. targionii* it differs by the dark exuviae, and other characters. Nor will it agree with the other species, *pergandei*, *protus*, *zizyphus*, and *victrix*."

DATE PALM SCALE.

Parlatoria victrix, Cockerell.

(Plate VII, Fig. 15.)

This scale was introduced upon some date palms received by the Department of Agriculture, Washington, D. C., from Cairo, Egypt, in 1890, and later distributed to Phoenix (Ariz.) Experiment Station and the Tulare and Chino Experiment Stations in this State. The palms were treated with sprays, but enough scales escaped, as it is impossible to reach all by this method of disinfection. The trees at Phoenix were again treated by spraying, under the direction of Prof. J. W. Toumey, with a strong solution of kerosene emulsion, but this was not effective in exterminating the scale. The plants were afterward taken up and treated with a wash of one and a half pounds of whale-oil soap to each gallon of water. No live scales were found after this treatment.

Specimens received from the Chino Station showed live old and young scales. The trees were subsequently treated twice with hydrocyanic acid gas under a tent.

An inspection of the Tulare trees was made and they were found to be free from pests of any kind.

The female scale resembles *P. zizyphi*, but the large second skin, instead of being all black, is broadly margined with pale straw color. With the exception of the exuviae, the balance of the scale is white.

The male scales are smaller than the female, white, with light yellowish exuviae.

OLIVE SCALE.

Pollinia costæ, Targ-Toz.

(Plate VIII, Fig. 10.)

In 1887 a few olive trees were received at Pasadena, Los Angeles County, direct from Italy. In 1893 the trees were found to be very seriously infested with this small but destructive scale. A good idea of the manner in which it attacks the branches and twigs is given in the illustration. The trees were stunted, with scant foliage, having made very little growth the two years previous. The trees were destroyed and a thorough inspection of all olive trees in that district was made, but no more could be found. The scale has no particular form, but cluster over each other in dirty white masses.

FRINGED SCALE.

Planchonia (Asterolecanium) fimbriata, Fonscolombe.

(Plate VI, Fig. 2.)

This interesting scale was found upon climbing plants from Mexico, presumably from Mazatlan. The waxy test and fringe of this scale resembles *Asterolecanium pustulans*, Cockerell.

NEW SCALE.

Planchonia (Asterolecanium) pustulans, Cockerell.

(Plate VI, Fig. 11.)

This is a very interesting species. In the adult female it has a greenish test with a fringe of pinkish glassy tubes; in this it resembles *Planchonia fimbriata*.

This scale is occasionally found upon oleander from Honolulu. From the condition of the infested branches it is a very injurious species. Where each scale locates a depression is made in the bark, giving it a rough, scaly appearance.

OAK SCALE.

Planchonia (Asterolecanium) quericola, Bouche.

(Plate VI, Fig. 15.)

A specimen of this scale was received from Niles, Alameda County, April 10, 1896.* It was found upon Golden oak trees received from Rochester, N. Y. This is the first time this scale has been found in this State. The destruction of the trees was advised. Some of the twigs were completely encased by the scales. The adult female somewhat resembles a small *Lecanium*; it has two distinct colors; half

*Discovered by Mr. Wm. Barry, County Horticultural Commissioner of Alameda County.

of the scale transversely is lemon or yellowish, and the other half a dark olive green; around the edge of the scale is a short, double fringe of glassy tubes, the latter only observable by the aid of a good lens or microscope. It is a European species and said to have been very destructive to oak trees near Paris in 1836. It is also reported as occurring upon some oak trees at Nelson, New Zealand, where it is reported to be damaging the trees.

INDIAN WHITE WAX SCALE.

Ceroplastes ceriferus, Anderson.

(Plate VI, Figs. 5 and 12)

This a very conspicuous scale found upon camellia, gardenia, and orange plants and trees, received from Japan. It has also been found in Australia upon *Melaleuca hypericifolia* and *Myrica cerifera*, and in India upon *Celastrus ceriferus*, and on the Assam tea plant. This species was first mentioned by Dr. Anderson in 1790-91, and fully described by Mr. Maskell in his coccid notes, page 216, of the "Transactions of the New Zealand Institute," 1892. It reads:

"Test of adult female white or yellowish-white, waxy, convex, thick; frequently agglomerated in large masses covering the twigs of the food-plant [as shown in Fig. 12]. Separate individuals may range in size from $\frac{1}{4}$ to $\frac{1}{2}$ inch. Marginal tuberosities not distinguishable, though the margin is sometimes slightly flattened and irregular. The apex of the test is sometimes produced in a short pointed horn, not erect but bent over the test. The wax is rather soft and greasy. Test of the second stage slightly convex, elliptical; color grayish-white. Median dorsal region usually smooth, separated by a narrow depression from the marginal region, which exhibits eight tuberosities, three on each side and two terminal. Average length of test about $\frac{1}{4}$ inch.

"Adult female brown, very convex, elliptical, hollow beneath. Form lecanid but the anal cleft and lobes are not easily made out, being contained in a conspicuous cylindrical 'tail' or prolongation of the abdomen. Antennæ of six joints, of which the third is much the longest. Feet rather thick, but not at all atrophied; tibia scarcely longer than the tarsus; upper or tarsal digitules slender knobbed hairs, lower pair on the claw rather long, thick, and expanded at the end. Rostrum rather large; mentum doubtfully dimerous. Near the spiracles, on each margin, is a group containing eight large conical spines and about twenty-four smaller ones. Epidermis bearing many circular spinneret-orifices. When the 'tail' is subjected to the action of potash and subsequent pressure it is seen to contain at its extremity the abdominal lobes and the anogenital ring, which has six rather strong hairs.

"Female of the second stage brown, elliptical, slightly convex. Form lecanid, exhibiting the normal cleft and lobes; there is no 'tail' but the region surrounding the lobes is thickened. Antennæ and feet as in the adult, but the feet are more slender. The margin bears a row of very fine spiny hairs, and four spiracular groups of large conical spines. There are many small circular spinnerets on the epidermis.

"Larva yellow, elliptical flattish; length about $\frac{1}{4}$ inch. Form normally lecanid, the anal lobes bearing long setæ. Antennæ thick, with six rather confused joints. Male unknown."

RED WAX SCALE.

Ceroplastes rubens, Maskell.

(Plate VI, Figs. 3 and 4.)

This is occasionally found upon trees and plants received from Honolulu. The plants most frequently infested are ferns. This is probably because they are grown under trees for the necessary shade. Alligator pear and orange trees are also subject to their attacks. The illustration is a leaf of an alligator pear, and shows the manner in which they are most frequently found on the foliage; they also attack the twigs.

This scale has become a very serious pest on the Sandwich Islands. It is probably a native of India. Mr. Maskell reports it upon mango and *Ficus macrophylla*, collected by Mr. Koebele at Brisbane, Australia.

"Test of the adult female waxy, rather thick, dull red or pinkish throughout; form, subcircular, quite flat beneath, with an orifice for attachment to the plant, the upper surface with irregular sloping sides and flattish top, in the center of which there is sometimes a minute, indistinct orifice; from the orifice very distinct lines may be made out in some specimens, radiating to the margin; and the lateral irregularities may sometimes be resolved into seven or eight indistinct tuberosities. Diameter of test variable; specimens observed range from $\frac{1}{16}$ to $\frac{1}{8}$ inch.

"The test of the second stage appears to be similar to that of the adult, but smaller; it is very difficult to make out the lateral tuberosities, which sometimes seem to be only five.

"Test of the larva in its latest period before the first metamorphosis whitish, waxy, stelliform, having usually eight lateral radiating processes, and a dorsal convex mass of wax; average length of the whole, about $\frac{1}{16}$ inch.

"Adult female extracted from the test yellowish-brown or dark brown; subcircular, convex above and concave beneath; form, normally lecanid; anal cleft small, lobes triangular, each bearing a short seta; anal ring with six strong hairs. At the cephalic extremity there is a dorsal elevation or tuberosity, which bears several small subconical papillae. Antennae of six joints, of which the third is much the longest. Feet nearly atrophied, short, thick; tarsus very short, claw small, digitules slender knobbed hairs. Rostrum rather large; mentum monomerous. On the margin near the four spiracles is on each side a patch containing one large, thick conical spine and about twenty other smaller ones. Dorsal epidermis bearing some small circular spinneret-orifices.

"Larva dark yellow, flattish, elongated, distinctly lecanid. Eyes large, brown. Antennae of apparently six joints, but the fourth and fifth are not easily separable. Length of insect in this stage about $\frac{1}{16}$ inch at first, increasing to about $\frac{1}{8}$ inch with age. Male unknown."

In a case of spice and other economic plants received in San Francisco from Singapore, India, were a few cinnamon plants that were infested with a wax scale that is undoubtedly *C. rubens*, although the scales were smaller and differed slightly in color. (Plate VI, Fig. 3.)

NEW ARAUCARIA SCALE.

Dactylopius aurilanatus, Maskell.

(Plate VI, Fig. 13.)

Found upon *Araucaria bidwillii* from Australia. Mr. Maskell reports it upon *Araucaria excelsa* and other conifers in New Zealand, where it smothers the plants and soon renders them unsightly; he thinks that in a warm climate it would spread rapidly, as the eggs are very numerous and the larvæ very active.

"Adult female slightly elongated, nearly globulus, of a rich dark purple color, bearing on the dorsum a longitudinal band of bright golden-colored meal, with small patches of similar meal often visible on the edges. In alcohol or potash it produces a rich purple tint, and if crushed in the fingers stains them a dark red. The eggs, which are also purple, are laid in a mass behind the insect in a thin, white cottony web, the mass having thus a general dark gray appearance. Body obscurely segmented, length about $\frac{1}{16}$ inch.

"Antennae usually of eight joints, often of seven; in the former case the fourth, in the latter the third, joint is the longest, the rest subequal, except the last, which is fusiform, and nearly equal to the longest; all the joints have a few hairs, the last bearing several."

Eriococcus sp.

(Plate VI, Fig. 14.)

This is an Australian species found upon palms. Plants infested with this scale have the same dirty-black fungous growth upon the upper surface of the leaves that characterizes plants or trees attacked by *Lecaniums*.

LONG SOFT SCALE.

Lecanium longulum, Douglass.

(Plate VI, Fig. 7.)

This scale is found upon crotons, *Carica papaya*, palms, ferns, and casuarinas, from the Sandwich Islands. It resembles the "soft brown scale" (*L. hesperidum*), but is longer and narrower. Plants infested with this scale have the same smutty appearance that characterizes plants attacked by other *Lecaniums*.

Mr. Maskell reports this species from Fiji. Professor Cockerell found it in Kingston, Jamaica; also reports having received it from Cheshire, England, upon euphorbia that had been grown under glass. It has not yet been reported in the orchards or orange groves of this State. In the West Indies it is considered a rather serious pest.

NEW BLACK SCALE.

Lecanium nigrum, Nietner.

(Plate VI, Fig. 6.)

A smooth, oval, shiny black scale found upon ferns and other plants from the Sandwich Islands. It has been reported to exist in India and Ceylon, where it attacks coffee. Professor Cockerell says it is seldom found on the coffee, though "sometimes present in large numbers upon the croton-oil plant and the ceara rubber, where it produces the usual effect, viz., a heavy fall of leaf and black fungus."

All plants found infested with this scale have been destroyed.

FLAT BLACK SCALE.

Lecanium perforatum, Newstead; *Lecanium tessellatum*, Signoret.

(Plate VI, Fig. 1.)

This is a flat, dark scale frequently found upon palms from the Sandwich Islands and Australia, also occasionally upon such plants in hot-houses. There appears to be some question about the identity of this species. When it was first observed it was mistaken for *L. depressum*, Targ-Toz. Prof. Cockerell says: "While I cannot very well doubt that it is Newstead's *L. perforatum*, I must confess that I am not well satisfied about its distinctness from *tessellatum*."

ORTHEZIA.

Orthezia insignis, Douglass.

(Plate VI, Fig. 9.)

This is a very interesting cottony scale found upon some coleus from the East. The adult females retain their legs and antennæ even when the long, narrow egg-sac is fully developed; in this respect they resemble *Icerya purchasi* and differ from *Pulvinarias*.

This species is reported as abundant upon orange trees in Guadala-

jara, and upon lime trees in Aguas Calientes, Mexico. Should it obtain a foothold it would probably become a pest in the citrus orchards of this State.

NEW COTTONY SCALE.

Pulvinaria psidii, Maskell.

(Plate VI, Fig. 8.)

The coffee plantations in the Sandwich Islands were threatened with destruction by this pest. Letters received from there would indicate that the planters could see nothing but bankruptcy before them in their coffee business. Since the introduction of the ladybird, *Chryptolæmus montrouzieri*, the scale has been cleaned out, and the coffee bushes are now vigorous and healthy.

The trees and plants upon which this pest have been found and destroyed were ferns, orange, coffee, pomegranates, and alligator pears, from the Sandwich Islands. The scale somewhat resembles *Pulvinaria camellicola*, but the specimens that have been found have shorter and more fluffy egg-sacs. The following is Mr. Maskell's description:

"Adult female yellow or yellowish-brown, sometimes with a greenish tinge; size variable, reaching $\frac{1}{2}$ inch before the ovisac is formed, but shriveling at gestation. The ovisacs cover the twig or leaf with masses of dirty-white cotton, usually accompanied by black fungus. Antennæ rather long and slender, of eight joints, of which the third is the longest, the eighth next, and the rest shorter and subequal. Feet also rather long; the trochanter is large, and bears a very long hair; tarsus curved, and about half as long as the tibia; upper digitules fine hairs, lower pair long and dilated at the end. Abdominal cleft moderate; anogenital ring, with several hairs. The margin of the body bears a row of spiny hairs.

"Female of the second stage yellow, flattish, elliptical; length about $\frac{1}{10}$ inch. Antennæ of six joints.

"Larva yellow, flat, elliptical. Antennæ of six joints.

"Male unknown."

HONOLULU BEETLE.

Adoretus umbrosus.

(Plate VI, Fig. 10.)

This is a pest that is known in Honolulu as the "Japanese beetle." It works at night and attacks the orange, grape, peach, rose, and other trees and plants in such a way that nothing but the skeletonized leaves are left. They burrow in the soil in the daytime, coming forth after sundown. To guard against its introduction into this State, all fresh soil about plants in boxes from Honolulu is dumped into the bay.

It is a dark brown beetle; the head, thorax, and elytra are thickly covered with very short, light hairs that give it a grayish appearance; it measures about half an inch in length by one quarter of an inch in width.

SIX-SPOTTED MITE.

Tetranychus 6-maculatus, Riley.

This is the mite of the orange that has done so much damage in the citrus groves of Florida since 1886. Considering the enormous quantities of citrus trees that have been brought into California from Florida, it is surprising that it is not found all over the orange-growing sections

GRAPE-LEAF PHYTOPTUS.

Phytoptus vitis ?

On August 5, 1896, samples of grape leaves, accompanied by letter, were received:

"Here are some sample leaves from Florin, with some new disease, seems to be a mold. I am told of at least two vineyards affected by it, which makes it important enough, at least in my estimation, to have it investigated and reported on. No one seems to know cause, effect, or remedy."



Fig. 5. Injurious effect on grape leaf by the *Phytoptus vitis*.



Fig. 6. *Phytoptus vitis*, greatly enlarged.

The accompanying leaves had all the characteristic appearances of a fungous growth upon the under side. In some instances this growth covered the entire under surface of the leaf, and in others it was in irregular patches. It is of a felt-like, spongy nature, and yellowish-brown in color. Fig. 5 represents an affected leaf. Upon examining the affected portion of a leaf with a microscope, under an inch objective, it could be seen that the spongy matter was alive with what appeared to be mites. With a $\frac{1}{8}$ -inch lens the true character of the pest was revealed.

Description.—It is a *Phytoptus* having but two pairs of legs, near the head and reaching forward, as shown in Fig. 6. Upon the outer edge of each leg, between the tarsus and the claw, a bristle or hair protrudes that extends beyond the point of the claw. Along each side of the

cylindrical body are three or four hairs in the adult stage. Near the caudal extremity of the body are two longer hairs, one on each side. The body is a silvery or light lemon color, with very delicate bands or segments encircling it.

From the condition of the leaves this insect is considered a very serious pest. No vine can be fruitful, with its leaves attacked by thousands of mites, sucking its juices and destroying its organs by which it builds up its alburnum and root system for the following year.

Preventive Measures and Remedies.—Vines attacked by this pest should have all dry leaves and rough bark removed from or about them and burned up, during the winter, and the vines after pruning should be thoroughly sprayed with rosin solution or kerosene emulsion. As soon as the leaves start they should be thoroughly dusted with sulphur, in such a way that it will reach the under side of the foliage. Another application of sulphur should be made just after the fruit is set. As sulphur is the most efficacious remedy for this class of pest, a liberal use of it in the early part of the season will prevent any injury. Do



Fig. 7. Orange twigs showing effects of die-back; a, diseased; b, healthy.

not defer the work until the blotches on the leaves are in evidence, for nothing can then restore the leaf to a healthy condition. No cuttings should be taken from such vineyards for planting in other districts. See that no boxes or pickers go from an infested vineyard into clean sections, as it can be carried on the boxes or clothing.

FLORIDA ORANGE DIE-BACK.

Ezanthema.

This disease has done considerable damage in Florida. Walter T. Swingle and Herbert J. Webber, assistants in the Division of Vegetable Pathology of the Department of Agriculture, have investigated this disease in Florida and do not consider it contagious, but the cause is not yet thoroughly understood. Experiments and observations made by them lead to the conclusion that it is caused by malnutrition, the result of excessive use of organic nitrogenous fertilizers. As a remedy they recommend a discontinuance of such fertilizers, allowing weeds to grow and the use of a normal quantity of potash and phosphoric acid. As the trees recover a small amount of nitrogen should be given, in the form of nitrate of soda or sulphate of ammonia.

The principal symptoms of the disease are given in Bulletin No. 8 of

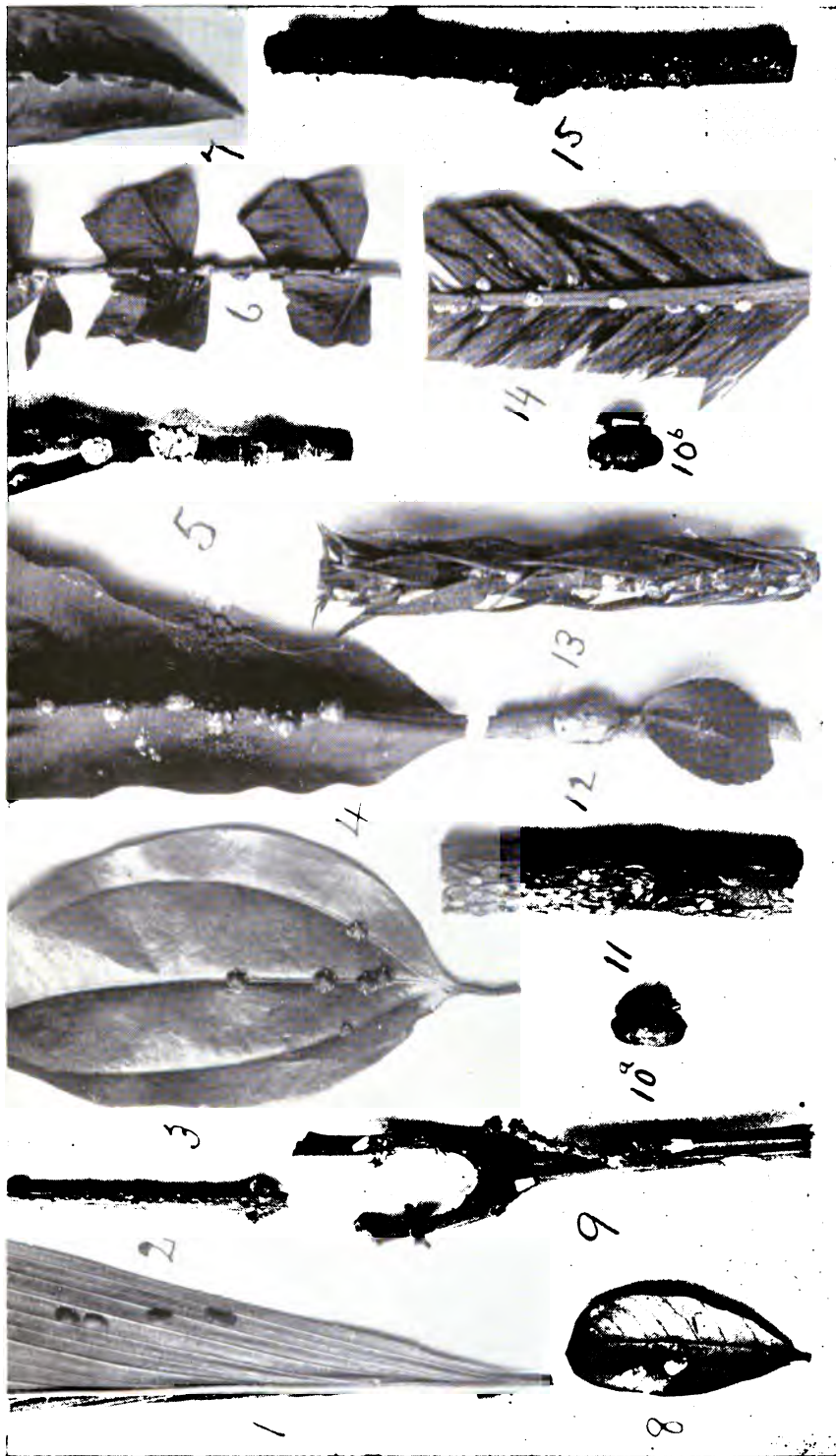
the Division of Vegetable Pathology (to which Division we are indebted for use of the illustrations), from which we quote:

"*Symptoms.*—1. The ends of the very rapidly growing shoots turn yellowish before maturing, and finally become stained reddish-brown in patches or throughout. This appearance is caused by a deposit in the outer cells of a reddish-brown, resin-like substance. This yellowing and staining of the twigs, which is very general on the new growth all over the tree, is followed by the dying back of the affected twigs for a short distance, usually three to six inches. The reddish stain may occur on the twigs back of the point to which they die, and, indeed, may spread in irregular patches more or less over the entire new growth.

"2. On the new growth (most frequently at the nodes, but sometimes in the internodes) there occur comparatively large swellings, caused by gum pockets formed in the wood. These pockets frequently become quite marked.

"3. Eruptions, caused by the bursting of the bark, very commonly occur on new and old twigs, as seen in the left-hand figure. In such cases the tissue swells up, protrudes from the rupture, and becomes stained by the reddish-brown, resin-like exudation which is so characteristic of the disease. These eruptions are very numerous, and in badly affected trees many limbs, from an inch in diameter down to the smallest, become thickly studded with them. This character almost invariably accompanies the disease, and is present at all seasons of the year, so that it may be regarded as the principal symptom. Trees may be slightly affected, however, and not show this symptom."

Specimens of diseased orange shoots were kindly forwarded to us by Mr. F. Austin, Secretary of the County Board of Horticultural Commissioners of San Diego County, found prevalent there on citrus trees brought from Florida. It would be well, therefore, for each Board of County Horticultural Commissioners in citrus-growing districts to take up this matter and have a careful examination made of all Florida-grown trees. The fact that the disease still existed in those trees after they had been planted in new soil and location for six years, would indicate that it is serious and not altogether controlled by treatment. No shoots should be taken from such trees for budding into other trees, or for nursery purposes.



SPECIMENS OF FOREIGN INJURIOUS INSECTS FOUND ON TREES AND PLANTS QUARANTINED IN THE STATE.

From photograph; natural size.

EXPLANATION OF PLATE VI.

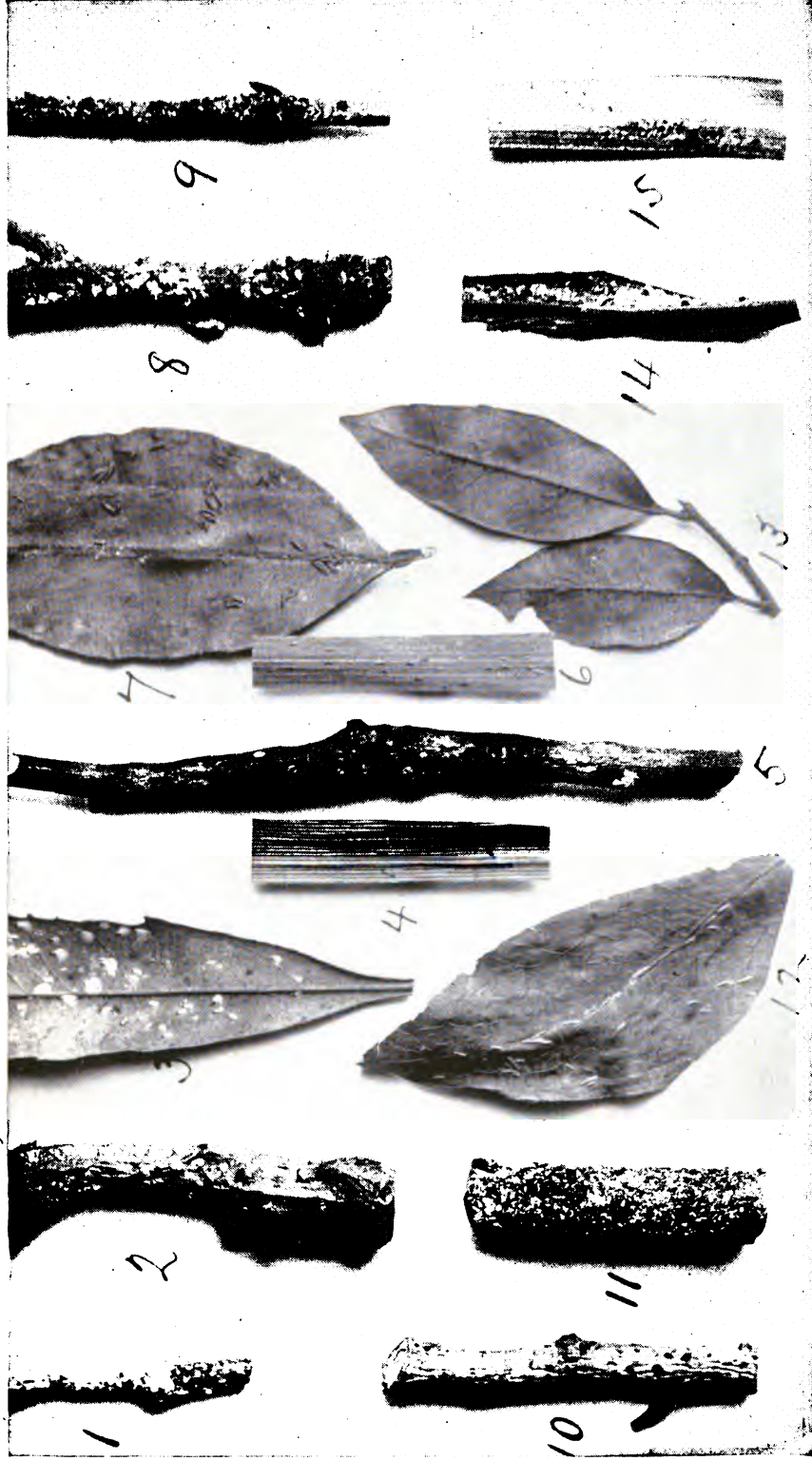
Scale Insects Found upon Quarantined Trees and Plants.

- Fig. 1. *Lecanium perforatum*, Newstead. Hawaiian Islands, palms, etc.
- Fig. 2. *Planchonia* (*Asterolecanium*) *fimbriata*, Fonscol. Mexico, ornamental plants.
- Fig. 3. *Ceroplastes rubens*, Maskell. India, cinnamon plants.
- Fig. 4. *Ceroplastes rubens*, Maskell. Honolulu, alligator pear trees, etc.
- Fig. 5. *Ceroplastes ceriferus*, Anderson. Japan, orange, camellia, etc.
- Fig. 6. *Lecanium nigrum*, Nietner. Hawaiian Islands, ferns, etc.
- Fig. 7. *Lecanium longulum*, Douglass. Hawaiian Islands, orange, etc.
- Fig. 8. *Pulvinaria psidii*, Maskell. Hawaiian Islands, orange, coffee, etc.
- Fig. 9. *Orthezia insignis*, Douglass. Eastern States, coleus.
- Fig. 10. *Adoretus umbrosus*, destructive beetle, Sandwich Islands.
- Fig. 11. *Asterolecanium pustulans*, Cockerell. Honolulu, oleander.
- Fig. 12. *Ceroplastes ceriferus*, Anderson. Japan, camellia, etc.
- Fig. 13. *Dactylopius aurilanatus*, Maskell. Australia, *Araucaria bidwillii*.
- Fig. 14. *Eriococcus* sp. Australia, palms.
- Fig. 15. *Planchonia* (*Asterolecanium*) *quericola*, Bouche. Rochester, N. Y., oak.

EXPLANATION OF PLATE VII.

Scale Insects found upon Quarantined Trees and Plants.

- Fig. 1. *Diaspis patelliformis*, Sasak. Honolulu, shrub.
- Fig. 2. *Diaspis amygdali*, Cockerell. Japan, plums, etc.
- Fig. 3. *Chionaspis chinensis*, Cockerell. China, on *Quercus*.
- Fig. 4. *Ischnaspis filiformis*, Douglass. Japan, *Pandanus*.
- Fig. 5. *Chionaspis biclavis*, Comstock. Tahiti, orange.
- Fig. 6. *Fiorinia camelliae*, Comstock. Honolulu, palms.
- Fig. 7. *Mytilaspis citricola*, Packard. Guatemala, lime trees.
- Fig. 8. *Chionaspis difficilis*, Cockerell. Japan, *eleagnus*.
- Fig. 9. *Chionaspis euonymi*, Comstock. Japan, *euonymus*.
- Fig. 10. *Parlatoria theae*, var. *viridis*, Cockerell. Japan.
- Fig. 11. *Chionaspis citri*, Comstock. Australia, orange, etc.
- Fig. 12. *Mytilaspis carinata*, Cockerell. Acapulco.
- Fig. 13. *Mytilaspis crawii*, Cockerell. Japan, *Quercus cuspidatus*.
- Fig. 14. *Chionaspis aspidistrae*, Signoret. Japan, *Aspidistra lurida*.
- Fig. 15. *Parlatoria vitrix*, Cockerell. Cairo, Egypt, date palms.



SPECIMENS OF FOREIGN INJURIOUS INSECTS FOUND ON TREES AND PLANTS QUARANTINED IN THE STATE.
From photograph; natural size.



SPECIMENS OF FOREIGN INJURIOUS INSECTS FOUND ON TREES AND PLANTS QUARANTINED IN THE STATE.

From photograph; natural size.



EXPLANATION OF PLATE VIII.

Scale Insects Found upon Quarantined Trees and Plants.

- Fig. 1. *Diaspis lanatus*, Morgan & Cockerell. Japan, cherry.
- Fig. 2. *Aspidiotus ficus*, Ashmead. Japan, *Aspidistra lurida*.
- Fig. 3. *Chionaspis assimilis*, Maskell. Australia, plant like eucalyptus.
- Fig. 4. *Aspidiotus rossii*, Maskell. Australia, olive, acacia, etc.
- Fig. 5. *Parlatoria pergandei*, Comstock. Florida, orange.
- Fig. 6. *Aspidiotus sphærioides*, Cockerell. Louisiana, plant like *Cordylina*.
- Fig. 7. *Chionaspis biclavis*, Comstock. Mexico, guava.
- Fig. 8. *Chionaspis biclavis*, Comstock. Mexico, gardenia.
- Fig. 9. *Aspidiotus albopunctatus*, Cockerell. Japan, orange.
- Fig. 10. *Pollinia costæ*, Targ-Toz. Italy, olive.
- Fig. 11. *Aspidiotus duplex*, Cockerell. Japan, orange, etc.
- Fig. 12. *Diaspis amygdali*, Cockerell. Japan, walnut.
- Fig. 13. *Aspidiotus* sp. Mexico, ornamental plants.
- Fig. 14. *Mytilaspis gloverii*, Packard, Japan.

IX.

**REMEDIES FOR THE DESTRUCTION OF INSECT PESTS,
FUNGI, ETC.**

LIME, SULPHUR, AND SALT FOR WINTER USE UPON DECIDUOUS TREES.

For Pernicious Scale, and as a Preventive of Curl Leaf on Peach Trees.

The following formula and directions, if properly carried out, will produce an effective solution:

Unslacked lime	40 pounds.
Sulphur	20 pounds.
Stock salt	15 pounds.
Water to make 60 gallons.	

Directions.—Place 10 pounds of lime and 20 pounds of sulphur in a boiler with 20 gallons of water, and boil over a brisk fire for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place the mixture will be of an amber color. Next place in a cask 30 pounds of unslacked lime, pouring over it enough hot water to thoroughly slack it; and while it is boiling add the 15 pounds of salt. When this is dissolved, add to the lime and sulphur in the boiler and cook for half an hour longer, when the necessary amount of water to make the 60 gallons should be added.

ROSIN WASH FOR WINTER USE UPON DECIDUOUS TREES OTHER THAN PEACH.

For Pernicious Scale and Lecaniums.

The following are the proportions of materials for the winter wash:

Rosin	30 pounds.
Caustic soda (70%)	9 pounds.
Fish oil	4½ pints.

Directions for Preparing the above Wash.—Place the rosin, caustic soda, and fish oil in a large boiler, pouring over them about 20 gallons of water, and cook thoroughly over a brisk fire for at least three hours; then add *hot* water, a little occasionally, and stir well until you have not less than 50 gallons of hot solution. Place this in the spray tank and add cold water to make the necessary amount. Never add *cold* water when cooking.

SUMMER WASH FOR PERNICIOUS SCALE, FUNGUS, ETC., UPON DECIDUOUS TREES.

Whale-oil Soap and Sulphide of Potash.

Whale-oil soap (80% strength)	20 pounds.
Sulphur	3 pounds.
Caustic soda (98%)	1 pound.
Commercial potash	1 pound.
Water to make 100 gallons.	

Directions.—Place sulphur, caustic soda, and potash together in about 2 gallons of water, and boil for at least one hour, or until thoroughly dissolved. Dissolve the soap by boiling in water; mix the two and boil for a short time. Use the solution warm.

ROSIN WASH FOR CITRUS TREES INFESTED WITH RED SCALE.

Rosin	20 pounds.
Caustic soda (70%)	6 pounds.
Fish oil	3 pounds.
Water to make 100 gallons.	

The directions for preparing this wash are the same as those given for the rosin wash recommended for winter use upon deciduous trees. August and September are the best months to spray citrus trees.

ROSIN WASH FOR NEWLY HATCHED BLACK OR SOFT BROWN SCALE UPON CITRUS TREES.

Rosin	18 pounds.
Caustic soda (70%)	5 pounds.
Fish oil	2½ pounds.
Water to make 100 gallons.	

The directions for preparing this remedy are the same as given for the rosin wash for winter use upon deciduous trees. In most districts of the State the black scales have hatched before the end of August, therefore September is a good time to apply this remedy.

FOR BLACK SCALE ON OLIVE TREES.

Directions for making emulsion:

Kerosene oil (Pearl, 150° test)	5 gallons.
Common laundry soap	1¼ pounds.
Water	2½ gallons.

Dissolve the soap by boiling in 2½ gallons of water, and while boiling remove to another vessel; add the kerosene, and churn for fifteen minutes, or until a stable emulsion is formed. Afterward dilute with 6½ gallons of hot water for each gallon of oil, and to the mixture add 2½ pounds of home-made soap dissolved in hot water. Apply at a temperature of 140° F.

FOR COTTONY CUSHION SCALE.

Rosin	20 pounds.
Caustic soda (70%)	6 pounds.
Fish oil	3 pounds.
Water to make 100 gallons.	

The directions for preparing this wash are the same as those given for the rosin wash for winter use upon deciduous trees.

Or, secure a colony of *Vedalia cardinalis* or *Novius Koebelei*.

August and September are the best months to spray citrus trees.

FOR APHIS UPON PLUM, PRUNE, AND APPLE TREES.

Caustic soda (98%)	1 pound.
Rosin	6 pounds.
Water	40 gallons.

Directions.—Prepare as directed in “rosin wash for winter use.”

FOR FLOWERING SHRUBS OR GARDEN PLANTS.

Whale-oil soap (80% strength).....	$\frac{1}{4}$ pound.
Water.....	1 gallon.

Directions.—Dissolve soap by boiling, and apply at a temperature of 100° to 120° F. For very tender plants the proportion of soap should be less.

FOR FLAT-HEADED BORERS.

Guard the stems of trees from infection by placing a shake or board on the south and west sides of the tree, which protects them from sunburn; or give a coating of whitewash, containing some soap and sulphur. In removing a borer, smear the wound over with grafting wax.

FOR PEACH-ROOT BORER.

Remove a few inches of the soil at the base of the tree in April, before the moths deposit their eggs, and wrap up the trunk for ten inches with stout paraffine paper, tie at top, and pile up against the paper a few inches of dry soil. In the winter remove the protectors, and examine the trees for borers. If gum exudes it is generally an indication of the presence of a borer. Carefully remove the bark with a sharp knife, and destroy the pest. Place sand against the wound, and replace the protector. A coating of whitewash, in which a little soap and sulphur have been mixed, and applied to the bark at the base of the tree, will prevent the moths from depositing their eggs.

FOR WOOLLY APHIS.

Dress liberally with ashes or air-slacked lime, especially in moist localities.

Brush or spray with kerosene emulsion or rosin solution, as recommended for aphid on plum, prune, and apple trees.

FOR CANKER OR MEASURING WORMS.

The wingless female moths should be prevented from climbing the trees to deposit their eggs in the fall. This can be done by placing a wire-netting trap, as shown on Plate XI, Fig. 2. First place around the tree a piece of cotton batting, and then a strip of wire netting of No. 16 mesh, 6 or 8 inches wide. Tie at top with cord or wire. See that the netting does not touch the tree at bottom. The insects will collect under it and go up as far as they can, being attracted by the light through the netting, and there perish. The season of oviposition in California is from the beginning of November until the end of December. After the female has ceased crawling or hatching, the traps should be removed and scalded, as eggs deposited on them will hatch and the minute larvæ will get through the mesh. The trunks of the trees below the trap should also be scrubbed or coated with a thick whitewash.

Remedy against the Larva.—Spray the infested trees with 1 pound of Paris green to 200 gallons of cold water. To make the Paris green more

insoluble and thereby prevent injury to the leaves, dissolve 6 pounds of fresh lime in water and add the latter to the solution. Keep the mixture constantly stirred when spraying.

FOR PEAR OR CHERRY SLUGS.

Use the Paris green solution, as recommended for canker worms, or throw dry pulverized soil or dust over the infested trees. This adheres to the slugs, causing them to drop to the ground, where they die.

FOR TENT AND TUSSOCK MOTH CATERPILLARS AND OTHER LEAF-EATING WORMS.

Spray with Paris green, as recommended for canker or measuring worms.

COMBINED REMEDY FOR CODLIN MOTH AND APPLE SCAB.

The Paris green solution has almost entirely superseded the band and trap system of fighting codlin moth (*Carpocapsa pomonella*). No matter how carefully the bands and traps were attended to, enough larvæ escaped so that there appeared to be as many wormy apples or pears the following season as before. With Paris green we destroy the worms before they have damaged the fruit. This is certainly more satisfactory to the orchardist, and requires less attention and work. No ammonia or soap should be used in the solution. In California we find that 1 pound of Paris green to 200 gallons of cold water is as much as the foliage will stand. The poison should be made into a paste before placing in the tank, and during the operation of spraying it should be *constantly* stirred.

Many poor and unsatisfactory results have been constantly reported, due entirely to adulterated Paris green. Growers should get a written guarantee from the dealers that the article contains at least 50% arsenious acid.

If any indications of "apple scab" (*Fusicladium dentriticum*) are observed, the following can be added to the Paris green solution: Dissolve 25 pounds of sulphate of copper in 20 gallons of water; slack 20 pounds of fresh lime; add to the copper solution, and strain into the spray tank with the Paris green, making 200 gallons of wash. This should be applied with a fine spray, and only sufficient used to each tree to thoroughly moisten it without running off. If the mixture has been constantly stirred, this will distribute sufficient Paris green over the young fruit to destroy the larvæ of the codlin moth before they burrow. The spraying should be done soon after the blossoms drop, and before the fruit turns downward. A second application should be made about sixteen days after the first, and in some districts a third application (of Paris green), at three weeks interval from the second, will be beneficial.

FOR DIABROTICA AND OTHER LEAF-EATING BEETLES.

Thoroughly mix 5 ounces of Paris green with 20 pounds of sulphur. Apply with sulphur-bellows in the morning, when the leaves are damp.

FOR GRASSHOPPERS OR LOCUSTS.

Thoroughly mix 40 pounds of bran, 20 pounds of middlings, and 20 pounds of arsenic; then add 2 gallons of cheap molasses and sufficient water to moisten the whole. Place a tablespoonful of the mixture a few inches from the tree or vine. Keep fowl and other domestic animals out of the orchard during the time the poison is out.

FOR RED SPIDER, YELLOW MITE, PEAR BLISTER MITE, AND LIGHT THRIPS.

Soon after the trees are in leaf in spring and while they are damp with dew in the morning, thoroughly dust them with sulphur. Use sulphur-bellows, or, if the orchard is extensive, fix up a broadcast seeder on a wagon. With this arrangement an orchard can be treated very thoroughly and with dispatch. Infested orchards should be treated at least three times during the spring and early summer.

FOR SHOT-HOLE AND OTHER FUNGI.

The trees should be sprayed with the "lime, sulphur, and salt" remedy before the buds start, and as soon as the fruit is set use the following: Dissolve 6 ounces of common glue by boiling in 1 gallon of water, and 2 pounds of carbonate of copper in 4 gallons of cold water. Mix the two, stirring well. Dilute with warm water to make 100 gallons of solution. Keep constantly stirred and apply with a fine spray.

GAS TREATMENT FOR DESTROYING SCALE INSECTS UPON CITRUS TREES.

Hydrocyanic acid gas is the most effective remedy for killing the "red scale" (*Aspidiotus aurantii*), the "purple scale" (*Mytilaspis citricola*), and other armored scales that have as yet no effective parasite to keep them in check. This gas is produced by the chemical action of sulphuric acid upon cyanide of potassium. The proportions of chemicals necessary for different sized trees near the coast and in the interior are given in separate tables.

To prepare the gas, the following instructions must be carefully observed: Place the necessary amount of cyanide of potassium, together with sufficient water, in an earthenware vessel; when the tent or canvas has been put over the tree and everything is in readiness, place the vessel under the canvas and add the sulphuric acid; a piece of sacking or burlap should be thrown over the top to spread the gas and prevent it from burning the leaves immediately above the generator. The tent must be made air tight around the bottom as soon as the acid is put in. This can be done by simply throwing some loose soil over the bottom of the canvas. The grade of cyanide of potassium that has given the most satisfaction and most uniform results is the fused (60%). It should not be left exposed, as it has a strong affinity for water and withdraws the moisture from the air, thus adding considerably to its weight.

The following table, giving height of trees and the proportions of

chemicals and water, will be found suitable for districts in the interior or beyond ten miles in a direct line from the seacoast:

Height of Trees— Feet.	Diameter through Foliage—Feet.	Water—Fluid Ounces.	Sulphuric Acid— Fluid Ounces.	Cyanide of Potas- sium—Ounces.
6	4	2	1	1
8	6	4	2	2
10	8	6	3	3
12	10	10	5	5
12	14	14	7	7
14	14	16	8	8
16	16	18	9	9
18	16	20	10	10
20	16	22	11	11
22	18	24	12	12
24	20	26	13	13
26	20	27	13½	13½
30	20	28	14	14

One would suppose that a tree having a dense foliage would fill up the space within the tent, and require less gas to be effective. But the cold surface of the leaves condenses the gas, and fumigators find that a slightly heavier charge of chemicals is necessary for such a tree, and where the foliage is scant a less amount than is given in the table will answer. In the experiments made near the coast it was found necessary to increase the amounts on large trees in order to do good work. The following table has been adopted for use near the coast:

Height of Trees— Feet.	Diameter through Foliage—Feet.	Water—Fluid Ounces.	Sulphuric Acid— Fluid Ounces.	Cyanide of Potas- sium—Ounces.
6	4	3	1½	1
8	6	6	2½	2
10	8 to 10	12 to 15	4 to 5	3½ to 4½
12	10 to 14	18 to 23	6 to 8½	5 to 7
14	12 to 14	26 to 30	8½ to 10	7 to 8
16	14 to 16	33 to 37	11 to 12½	9 to 10½
20	16 to 18	48 to 56	16 to 18½	13 to 15
24	18 to 20	67 to 75	22½ to 25	18 to 20

The cyanide should be used as coarse as possible, so that the chemical action will be less violent. The gas is also generated more evenly, and there is not so much danger of the chemicals boiling over or spattering the tent. The tent should remain closed for not less than forty minutes. This time is required to kill the eggs of the armored scales. As soon as the tent is removed the vessel should be rinsed with clean water and prepared for another charge, while the men are changing the tent.

The Sheet-Tent (see Plate X).—This is a very simple arrangement and the most satisfactory tent now in use, and one that has greatly reduced the cost of a fumigating outfit. The illustration is of an outfit at work on an orange grove. The two poles, or uprights, are of dressed Oregon pine, 2x4 inches and 24 feet high. Across the bottom of the poles are bolted—one on each side—two pieces 1x3 inches and 6 feet long. From each end of the cross-pieces a brace, 2x4 inches and 4 feet long, is fastened to the upright pole. The cross-bar prevents the pole from falling sideways when raising the tent over the tree. A ¾-inch guy rope, 33 feet long, is fastened at the top of each pole in front. A

4-inch block is fastened in the rear at top, and another block where the braces join the upright; through these is passed a $\frac{1}{4}$ -inch rope 70 feet long, to raise the tent. In raising the sheet the edge is gathered, and a hitch with the rope around it makes it fast, so that it can be drawn up. When all is ready the sheet is dropped on one side of the tree; the uprights are raised, one on each side; the ropes are adjusted to the edge of the sheet and hoisted; each upright is steadied by a man with the guy rope. When raised sufficiently, the men pull on the guys, thus bringing the sheet forward and over the tree. The uprights are allowed to drop on the ground, leaving the tent in position.

X.

ACKNOWLEDGMENTS.

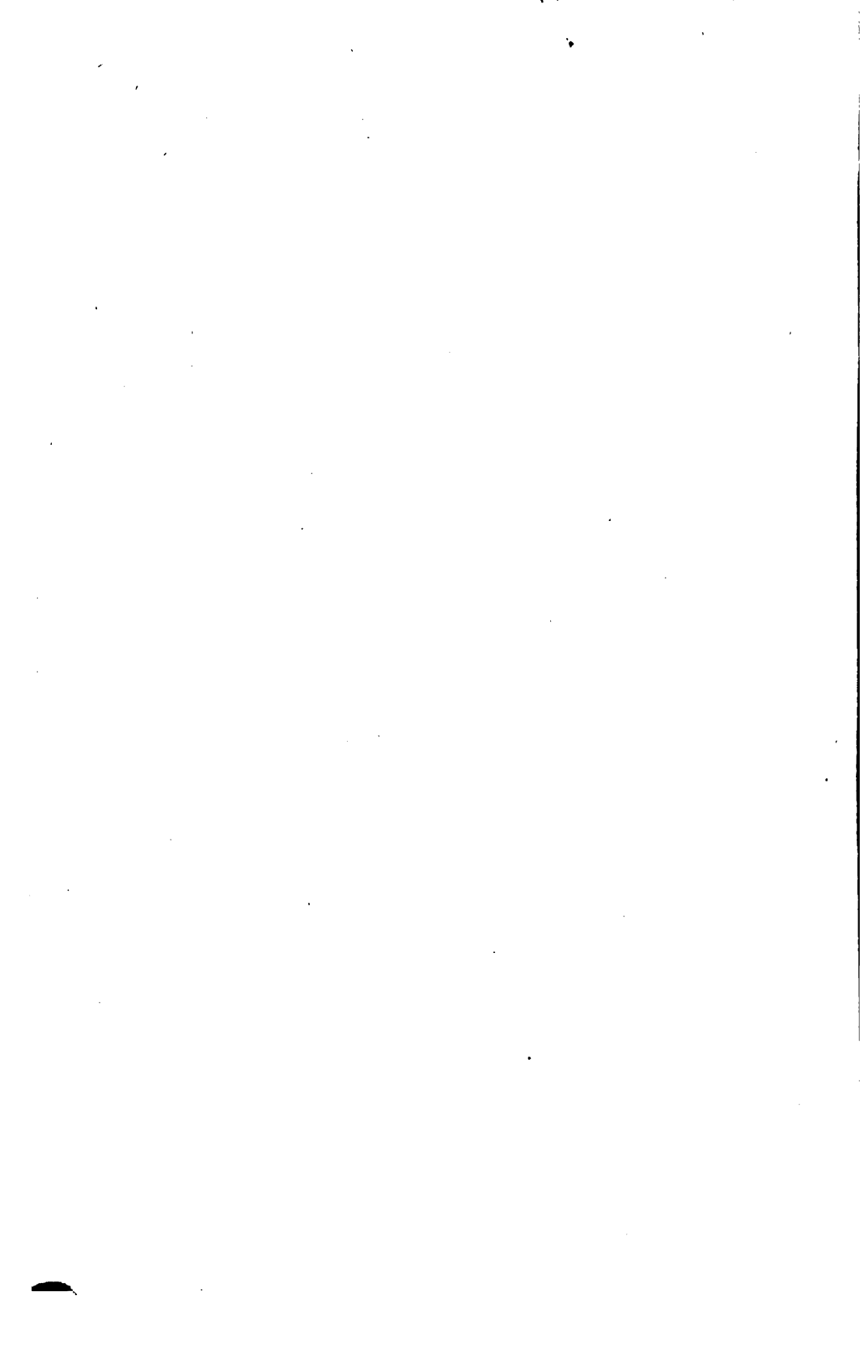
In acknowledging the valuable assistance rendered this department by your Excellency, without which it would have been impossible for us to succeed in the administration of our affairs and the completion of the present volume, we extend to you our most hearty and sincere thanks. It also affords us great pleasure to acknowledge with gratitude the valuable assistance and financial aid rendered this department by the fruit-growers of the State, and especially by Mr. A. B. Chapman, of San Gabriel, Mr. N. W. Blanchard, of Santa Paula, Mr. E. E. Goodrich, of Santa Clara, Mr. Timothy Hopkins, of San Francisco, Mr. D. O. Mills and his able Superintendent, Mr. H. H. Taylor, of San Francisco, the Saratoga Packing Company, of Los Gatos, the Limonia Company, of Ventura, and others.

To Hon. L. H. Brown, Secretary of State, our thanks are especially due for having provided us, at your request, with suitable offices in the State Capitol, and also for having assisted in fitting up same. Hon. A. J. Johnston, Superintendent of State Printing, has merited our thanks for furnishing us with photographic electro plates and for other assistance, without which our report would have been lacking in interest. To the Board of State Harbor Commissioners our thanks are specially due for having provided us, in accordance with your request, with suitable rooms on the waterfront for a branch office, where our Quarantine Officer is stationed. To Cornell University Experiment Station, and to Prof. J. Henry Comstock and his assistant, Prof. M. V. Slingerland, our thanks are due for the loan of the cuts of pear psylla, bud moth, and cigar-case bearer, shown in Plates I and II. To the State Board of Agriculture of Massachusetts, Prof. E. H. Forbush, Director of Field Work, for the use of a plate showing the cutting and burning of woods infested with gypsy moth, we tender our thanks. To the California Nursery Company, of Niles, Mr. John Rock, President, our thanks are due for donations to the Board, consisting of an extensive variety of walnuts and almonds, also olives and olive oil, in variety; to Mr. A. F. Abbott, of Yuba City, for the donation of an extensive collection of dried and preserved fruits, in variety, now on exhibition in our offices in the State Capitol. To our old friends and associates, for many years members of this Board, Hon. I. H. Thomas, of Visalia, and Hon. J. L. Mosher, of San Francisco, we

extend our hearty and warmest thanks for the many years of gratuitous servitude to the State in behalf of the horticultural interests. To our officers and clerks our thanks are extended. We desire to compliment them all for their indefatigable efforts in the performance of their respective duties.

ELLWOOD COOPER,
MARK L. McDONALD,
FRED C. MILES,
R. D. STEPHENS,
FRANK A. KIMBALL,
SOL. RUNYON,
BEN M. MADDOX,
A. BLOCK,
FRANK H. BUCK,
Commissioners.

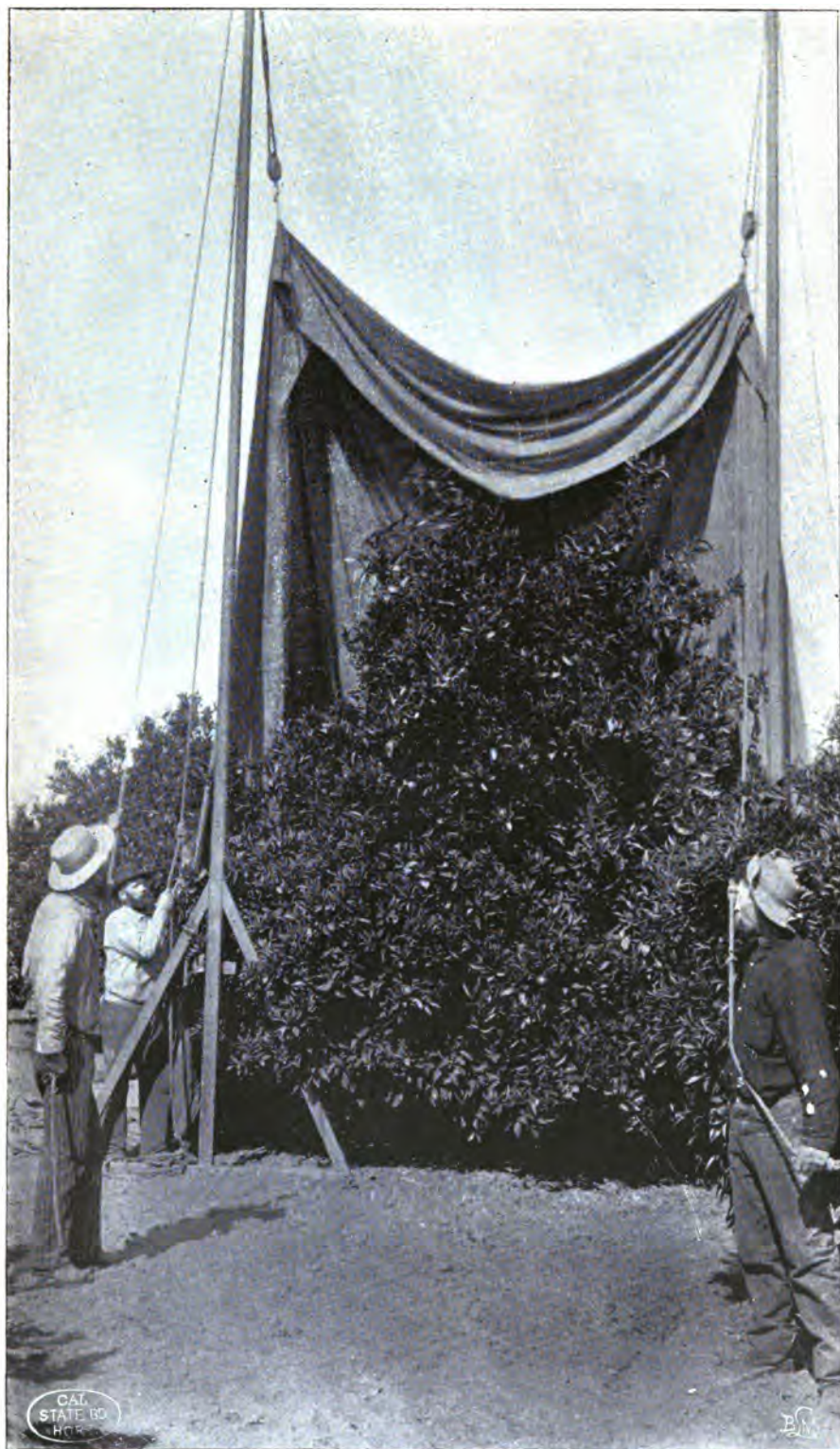
B. M. LELONG,
Secretary, and Chief Horticultural Officer.





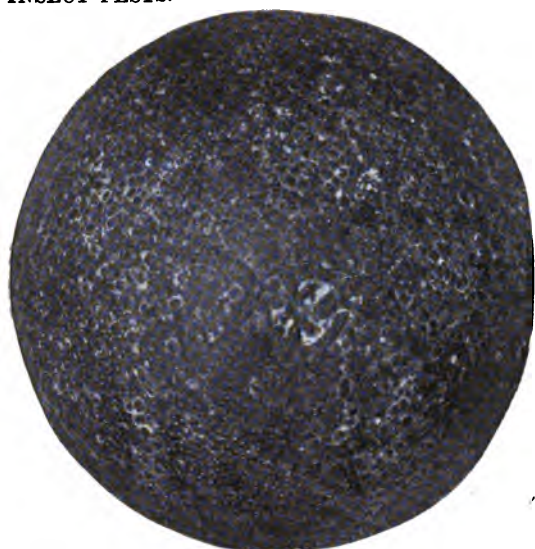
LEAVES AFFECTED BY THE PEAR LEAF BLISTER MITE (*Phytoptus pyri*).
The lower leaves show the gall stage; the upper leaves represent the condition of the leaves after the galls have dried up.





IMPROVED APPARATUS FOR TREATING CITRUS TREES WITH HYDROCYANIC ACID GAS—SHEET TENT.





1



2



3

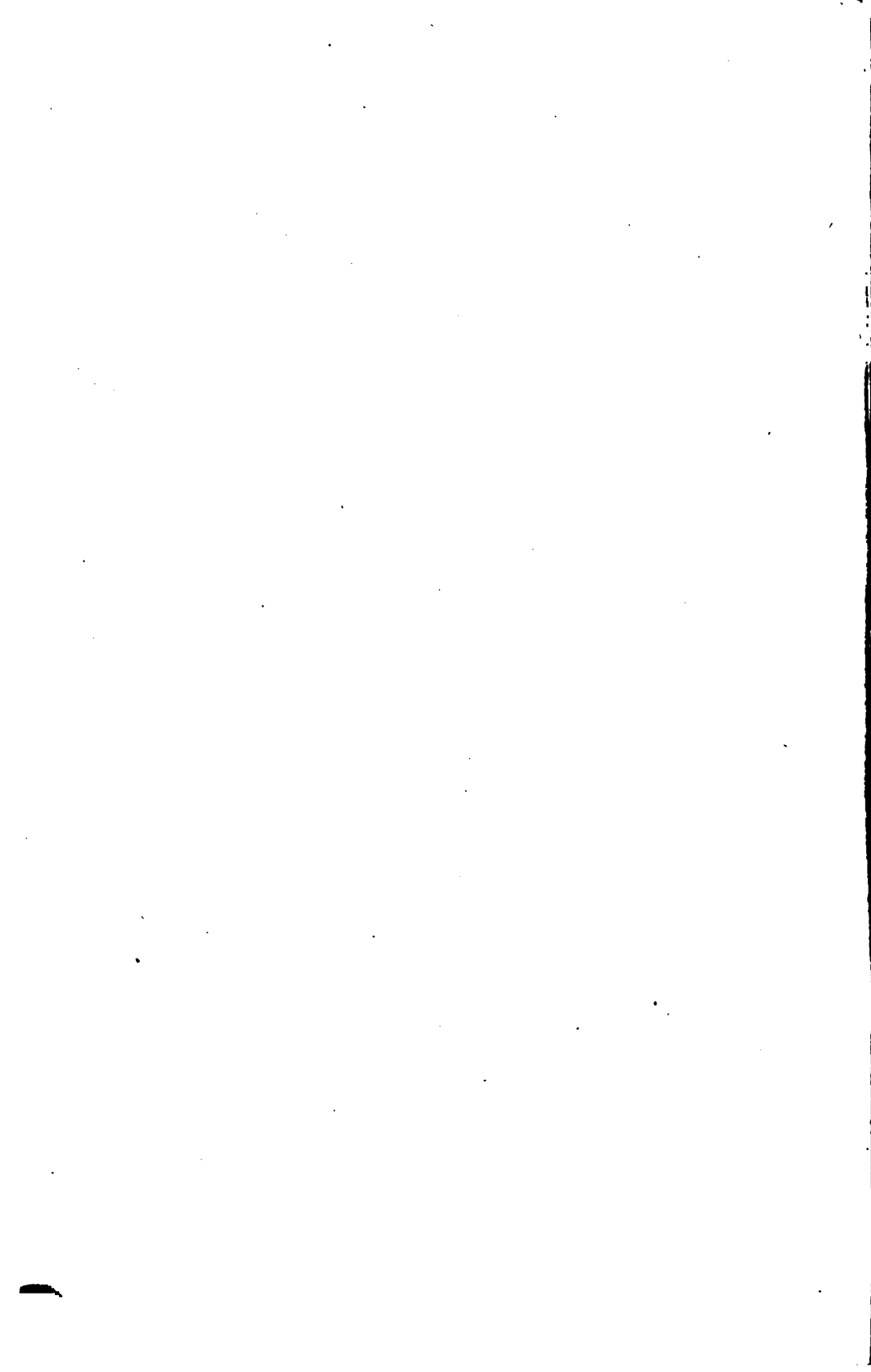


4

1. Navel orange badly infested with red scale (*Aspidiotus aurantii*).
2. Wire-netting trap used extensively in Santa Clara County to prevent the cankerworm from ascending trees.
3. Prune branch infested with black scale (*Lecanium oleae*), showing the twice-stabbed lady-bug at work.
4. Prune branch infested with the brown apricot scale.

REPORT
OF
B. M. LELONG,

Secretary, and Chief Horticultural Officer.



REPORT OF B. M. LELONG,

Secretary, and Chief Horticultural Officer.

XI.

REVIEW OF THE FRUIT SEASONS 1895-96.

The fruit season of 1895 opened very encouragingly, but prices obtained throughout the season as a whole proved a great disappointment to the growers of fresh deciduous fruits. Chief among the causes which led to the deplorable results of the season were, constant glutting of the Eastern markets by the indiscriminate shipments of fruit consigned to parties unqualified to handle the product intelligently, and the existence of two or more auction salesrooms at many Eastern auction points.

In November, 1894, a convention of fruit-growers was held under the auspices of this Board, in the State Capitol at Sacramento, and the subject was thoroughly discussed, which resulted in the establishment of an association known as the Fruit Growers and Shippers' Association, in accordance with the following resolution:

WHEREAS, Owing to certain causes, the shipping of fresh fruits to the markets of the East has more recently proven highly unprofitable; and whereas, a continuance of these causes must mean ruin to untold numbers of growers, and must seriously threaten the future of the fresh-fruit industry of our State; and whereas, we have reason to believe that by united action on the part of commercial shippers, local associations, and individual growers shipping in carload lots and routing their own fruit, many of these causes may be promptly removed, and certain existing evils overcome; therefore, be it

Resolved, That without reference to any great popular movement to unite the fruit-growers of the State in one organization for general purposes, but in addition and auxiliary to that movement, this convention recommends and earnestly requests the classes of growers and shippers above mentioned to proceed forthwith to organize themselves into a union to be known as the Fruit Growers and Shippers' Association of California; and be it further

Resolved, That the purposes of the proposed association shall be: (1) the establishment of a Bureau of Information to regulate distribution; (2) to establish one auction-room in each city; (3) to make such auction-rooms open and free to all buyers; (4) to do all such other things as may be conducive to the best interests of the fresh-fruit industry of California; and be it further

Resolved, That the President of the convention be requested to appoint a committee of five, which shall represent all the above classes of shippers, for purpose of taking steps to carry the above resolution into effect; and be it further

Resolved, That the California Fruit Exchange, as it proceeds in its work of organization, be requested to make the importance of maintaining such association very prominent, and to impress upon all growers the necessity of strongly supporting it in all ways; and be it further

Resolved, That the members of this convention hereby pledge themselves to give such association, when formed, our continuous and hearty support.

A bureau of information was established, with headquarters at Sacramento, and daily bulletins issued throughout the season, which were of incalculable value to the growers and largely prevented unnecessary gluts, and kept the growers informed as to the movements and distribution of their fruit. That this association would have easy sailing was a source of much doubt in the minds of its projectors, who duly consid-

ered the conflicting interests among buyers and sellers in the East, and which they tried to avert, but without success. Consolidated salesrooms were operated in Chicago, Boston, and New York, much to the detriment of shipments of California fruit, by forcing the same into needless competition with itself, to the disadvantage of the shippers.

At the subsequent convention held at Sacramento, in November, 1895, a report was made by the President of the Association, Mr. H. Weinstock, covering the period of the year's shipments, in which report all matters are treated in detail (see Report Nineteenth Fruit-Growers' Convention, pp. 10-17). The convention passed the following resolutions:

WHEREAS, The fruit-shipping season of 1895 has made it plainer than ever that in order to prevent California fruit from coming into needless competition with itself, and in order to give the California fruit-grower the benefit of the fullest and freest competition among all buyers and all auctioneers at each auction point, it is imperative that the sales of California fruit shall be held in consolidated salesrooms, where all buyers and all auctioneers in each city may be brought at the same hour under one roof; therefore, be it

Resolved, That the California fruit-growers assembled in State convention, under the auspices of the State Board of Horticulture, do hereby call upon the shippers and receivers of California fresh fruits to coöperate with the growers in establishing and maintaining such consolidated auction salesrooms;

Resolved, In order that growers may avail themselves of the privilege of shipping either over the Erie or West Shore railway lines to the City of New York, that it is the expressed desire of the California growers that an outside room be selected, convenient to the piers of the above railroads, to be used as the consolidated salesroom for the City of New York, which consolidated salesroom shall be open to all auctioneers of California fruits upon equal terms and conditions, so long as such auctioneers conduct sales which are free and open to all buyers;

Resolved, In order that growers and shippers may have the privilege of routing their fruit over any one of the several railway lines entering Chicago, that a railway terminal shall be chosen in said city, which shall be free and open to all competing railway lines, subject to the established charges for switching, unloading, etc., and that the auction salesroom at such terminal shall be free and open to all auctioneers upon equal terms and conditions, so long as such auctioneers conduct sales which are free and open to all buyers;

Resolved, That we solemnly pledge ourselves to confine our support to such shippers and receivers as comply with these resolutions.

In the discussion that followed, it was contended that higher prices were obtained on the Erie than on the West Shore pier. The following figures are given, showing the number of packages sold and amount realized:

New York Sales from August 15th to October 19th, inclusive.

	West Shore.			Erie.		
	Number of Packages.	Amount Realized.	Average Price per Package.	Number of Packages.	Amount Realized.	Average Price per Package.
Bartletts	26,431	\$54,430	\$2 06	17,272	\$32,714	\$1 88
Assorted Pears	1,442	2,653	1 84	1,867	2,813	1 50
Prunes	11,604	13,851	1 20	11,373	10,875	96
Plums	3,850	3,778	98	2,384	2,311	97
Peaches	31,489	26,198	83	38,238	31,999	83
Tokays, s. c.	44,583	4,335	1 11	40,194	46,589	1 13
Tokays, d. c.	7,648	15,718	2 06	6,217	14,103	2 27
Muscats	3,593	2,937	82	5,163	5,135	99
Assorted Grapes....	3,483	3,581	1 03	6,061	4,635	76
	134,123	\$127,481	-----	128,769	\$151,174	-----

Total realized on Erie \$151,174 00

If sold at Union prices would have realized..... 158,197 00

Loss to Erie \$7,023 00

Or a little more than 5%.

The foregoing figures show that the Erie sales realized on an average 5% less than the prices received on the West Shore pier, operated by the Association.

The work of the Fruit Growers and Shippers' Association was approved by the convention, as the following resolution shows:

WHEREAS, A resolution was adopted unanimously at the Eighteenth Fruit-Growers' Convention, providing for the formation and organization of commercial shippers, local associations, and individual growers shipping in carload lots, into a union to be known as the California Fruit Growers and Shippers' Association, to provide for (1) the establishment of a bureau of information to regulate the distribution of fresh fruit; (2) to establish one auction-room in each city; (3) and to make such auction-room open and free to all buyers; and whereas, such an association was formed and has earnestly endeavored to accomplish the results set forth in such resolution, and to remedy the grave evils that in the past have caused the shipping of fresh deciduous fruits to the markets of the East so unprofitable to the grower; and whereas, this convention, recognizing the zeal with which said labors were performed by said association, and the energy and time so freely given by the members thereof, for the benefit of the fruit industry of the State; therefore, be it

Resolved, That the fruit-growers of California, in convention assembled, do hereby most heartily approve of the actions of said association in its endeavors to bring into existence conditions that would make the growing of fruit in this State a profitable industry, and we commend the zeal of its members and officers, and hereby pledge it our hearty and continued support.

With the view of bringing about a unity of action and harmony among conflicting interests, a committee was appointed, in accordance with the following resolutions:

Resolved, That the Chairman of this convention appoint a conference committee of seven members, who shall be chosen so as to represent all of the interests of the fresh deciduous fruit industry of this State; and be it

Resolved, That such committee shall meet at an early date, and shall request the attendance of all interested parties with the view of harmonizing such conflicting interests as may exist; and be it

Resolved, That all commercial shippers, fruit-growers, and other persons be and are hereby respectfully requested to respond to any request of such committee for attendance, and lend to it their most earnest support.

The committee met on the 8th of April, 1896, and adopted resolutions, which they submitted to the association at a meeting in Sacramento. April 11th, tending to harmonize conflicting interests, and which the association adopted, as follows:

WHEREAS, At the State Convention of Fruit-Growers, held in Sacramento, November 18, 1895, a Committee of Conference, consisting of seven growers and shippers, representing the various elements engaged in the fresh-fruit trade, were appointed, with instructions from the convention to harmonize existing differences between shippers and growers, with the view of establishing consolidated auction salesrooms in the various Eastern markets for the sale of California fresh fruits; and whereas, said Committee of Conference having thoroughly gone into the matter, and having found that the consolidated salesrooms established on neutral ground, convenient to the various railroad terminals in each city, are not alone entirely practical and desirable, but for the welfare of the fruit interests are imperative; be it therefore

Resolved, That this Committee of Conference do hereby call upon the California Fruit Growers and Shippers' Association to establish such consolidated auction salesrooms upon neutral ground in the various Eastern cities, said salesrooms to be under the absolute control of the California Fruit Growers and Shippers' Association, and made free and open to all buyers, auctioneers, receivers, and shippers of California fresh fruits upon a fair and equitable basis to all, under such rules and regulations as the Association may establish; and be it further

Resolved, That this Committee of Conference, representing as it does the growers and shippers of fresh fruit of the State of California, hereby earnestly call upon all growers, shippers in carload lots, and upon all coöperative societies and fresh-fruit shipping companies whose names are not yet enrolled, to become members of the California Fruit Growers and Shippers' Association, and to lend their fullest and heartiest support to said association in its endeavors to carry out the desire of the growers and shippers of California to establish and maintain consolidated auction salesrooms free and open to all, and to continue the publication of daily bulletins, tabulating the daily shipments of fruit for the guidance of growers and shippers;

Resolved, That it is the sense of the Fruit Growers and Shippers' Association that directors of the association be authorized to proceed to establish consolidated auction salesrooms upon neutral ground in the various Eastern cities, said salesrooms to be under the absolute control of the California Fruit Growers and Shippers' Association, and made free and open to all buyers, auctioneers, receivers, and shippers of California fresh fruits, on a fair and equitable basis to all, under such rules and regulations as the association may establish.

After the election of a Board of Directors, the following rules for the governing of the auctions and auction-rooms were adopted:

Rule 1. This auction-room is absolutely open and free to all buyers who can conform to the terms of sale.

Rule 2. Time of holding the sale shall be left to the discretion of the receivers and auctioneers, except that after the sale commences it shall be continuous until all the fruit to be sold on that day has been disposed of.

Rule 3. Any auctioneer or auction company selected by the receiver whose fruit is to be sold can sell in this room, providing said auctioneer or auction company subscribe to the rules established by this association.

Rule 4. All fruit to be sold shall be displayed at the terminals. Same shall be in charge of the receiver, and shall be ready for inspection at least one hour before the sale commences.

Rule 5. Fruit shall be catalogued in a manner that is entirely equitable to all receivers, and the different receivers will be given alternate cars on the catalogue.

Rule 6. The premises will be furnished free by the California Fruit Growers and Shippers' Association, but the auctioneers shall pay between them the cost of portorage or janitorship, and rent of telephone, light, and heat.

Rule 7. Before making returns to receivers the auction company shall withhold — per car, to be remitted to the California Fruit Growers and Shippers' Association.

SHIPMENTS OF FRESH FRUIT.

The shipments of fresh fruit East, in 1895 and 1896, up to September 10th, are given in the following report, from the President and General Manager of the California Fruit Growers and Shippers' Association, prepared by special request, for which we make due acknowledgment:

Cities.	June. (No. of Cars.)		July. (No. of Cars.)		August. (No. of Cars.)		11 days in September. (No. of Cars.)	
	1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
Chicago	140	115	272	187	354	266	225	186
New York	80	79	166	185	265	340	174	170
Boston	23	28	72	99	109	173	42	75
Philadelphia	15	11	20	19	23	31	16	6
Minneapolis	15	16	31	30	49	56	21	20
Baltimore	8	9	10	3	8	1	1	0
Cincinnati	2	0	0	0	7	0	1	0
Kansas City	6	3	13	14	22	27	9	10
Montreal	3	6	23	29	33	42	7	2
New Orleans	3	4	5	6	16	17	19	23
Denver	6	4	26	22	36	42	9	15
St. Louis	11	4	7	5	20	11	16	15
St. Paul	10	9	17	12	47	37	27	17
Omaha	13	7	51	18	64	24	28	11
Cleveland	2	0	13	3	23	6	4	1
Pittsburg	2	5	9	6	14	9	7	3
Buffalo	1	1	4	4	13	2	3	0
Milwaukee	0	0	9	10	19	15	13	4

	1895.	1896.
Total number of cars shipped to June 30	543	449
Total number of cars shipped to July 31	1,690	1,405
Total number of cars shipped to August 31	2,989	2,602
Total number of cars shipped to September 11	3,408	3,050

It will be noted that up to September 10th the shipments for 1896 have been a little over 10% less than in 1895. The present indications are that the increased shipments over last year, beginning with September 1st, may overcome the decline in the season's shipments prior to that date, provided there are no rains during September and October, and the present fair-sized grape crop can all be harvested.

The shipping season up to date has not been an entirely satisfactory one. While on the one hand the California Fruit Growers and Shippers' Association has been entirely successful in bringing about a harmony of spirit and a unity of action among shippers and growers, and has thus been able to establish in the principal Eastern auction markets consolidated auction salesrooms free and open to all auction companies, buyers, shippers, and receivers, other conditions this season, however, have been such as to seriously depress prices on certain lines of fruit. While plums and prunes have, as a rule, brought very satisfactory prices throughout the season, and while peaches, considering the unusually large Eastern crop, have done fairly well, Bartlett pears, owing to an abnormal California crop of under-sized fruit, have done very poorly, have brought the growers little or no return, and have, more or less, depressed prices in the Eastern markets on other California fruits. More especially was this the case during the hot Eastern wave in August, which most seriously demoralized the fruit markets for many days, from which demoralization it was no easy matter for the market to recover.

Not least among the depressing causes for low prices is and has been the distressingly hard times throughout the East. Large numbers of mills and factories have been closed down for want of orders; thus throwing out of employment multitudes of fruit-consumers who were very glad to get along without fruit, if they could but get bread.

If, in the face of the depressing hard times, the large Eastern crops, the abnormal California pear crop, the unprecedented hot wave in August, there had also been divided auction houses in the different Eastern cities this year, thus perpetuating the California fruit war of last year, the results to the grower would have been still more distressing, if not utterly disastrous.

The method of selling California fruits in consolidated auction-rooms is now no longer an experiment, but an assured success, and there is every reason to believe that the growers and shippers will find it to their interest to continue to harmonize whatever differences may arise, with a view of perpetuating consolidated auction salesrooms free to all.

H. WEINSTOCK,

President California Fruit Growers and Shippers' Association.

CITRUS FRUIT EXCHANGES.

The successful methods of marketing citrus fruits in the southern part of the State are entirely due to coöperative associations or exchanges. The following review was prepared by special request by Col. T. H. B. Chamblin, who has been a prime mover in their organization, and to which we call special attention:

It cannot be denied that, speaking in general terms, the horticultural interests of California are in bad shape. The climatic and soil conditions are all that could be desired; the producers are, as a rule, energetic, enterprising, and intelligent; California products are in demand in most of the markets of the country. These general bad conditions to which we refer had their beginning prior to the panic. In no case can it be shown that they are the result of overproduction. The raisin industry, located as it is, practically, in the central part of the State, will serve to illustrate the whole. Statistics in this case show the production to be from ten to twenty millions of pounds short of the consumption of the United States and Canada. It has been stated, upon what is supposed to be good authority, that the crop of last season cost as much, or possibly more, to produce it than the growers received. To what can this be attributed? The more conservative and intelligent dealers in that product at the market end of the line attribute it wholly to the methods of marketing. They do not hesitate to say that proper control and distribution at this end of the line would correct the evil and enable them to obtain paying prices. In short, they declare that the difficulty lies in the lack of concert of action on the part of the growers. Actual occurrences in the markets, illustrating and confirming this proposition, might be given almost without number, if time and space would permit. This suggests organization among the growers. Where properly applied this has proven effective, but effective only to the extent that the growers have given loyal support to the organization. The producers of raisins and other industries have had organizations defective in character, and therefore failed. In the season of 1894, however, five small organized bodies of raisin-growers in the vicinity of Fresno came together in what is known as the exchange system of marketing. From the information at hand the result shows that the growers thus organized obtained a better average price than that obtained by the growers whose crops were handled under the methods as they usually obtain in the marketing of California products, viz., the commission system. This, too, in the face of the fact that only about 12% was under organized control. The importance of organization was so clearly demonstrated that six

additional coöperative associations have been recently added to the number, making eleven in all united under the exchange system, and so located as to practically cover the raisin district. This was accomplished despite a strong counter movement headed by an incorporated consolidation of the speculators who had previously handled the product upon a commission basis. They presented a solid front with a capital stock of a million dollars, reinforced by strong local influences in their behalf; and thus equipped they set out to contest the field with coöperation. They claimed to have handled 80% of the crop the past season, and through these combined influences they sought to control a like proportion for the coming season. A lively campaign of two months by the contending forces demonstrated the fact that the growers could not be induced to repeat the experiences of the past with an open door of escape before them. Coöperation closed the campaign with the result as above stated, while the proposed combine went to pieces—were compelled to abandon the commission proposition, and cash offers were promptly made for raisins in the sweat-box at double and, in some cases, more than double the average price obtained under the commission system of the past year.

In the season of 1893 the orange industry of Southern California had practically reached the condition of the raisin industry as above outlined. While it might not be susceptible of practical demonstration that the industry was absolutely bankrupt, it is nevertheless true that values were rapidly depreciating and general discouragement prevailed among the growers, as the result of the haphazard and unbusinesslike methods of marketing the product. The prevailing conditions of depression gave rise to a universal cry for relief, and resulted in the organization of the Southern California Fruit Exchange, now so widely known and universally regarded as the hope of the citrus industry. As the result of its operations the downward tendency of values has been stayed, the commission business has suspended operations, actual purchase of the fruit at prices fixed by the Exchange has taken its place, and the business is restored to conditions of general prosperity and contentment.

All this argues not alone in favor of organization, but necessarily in favor of a specific kind. The exchange system seems to have met the conditions and overcome the evils, and would therefore seem to be entitled to the consideration of the growers of the State. Of this system, coöperation is the foundation, and centralization in marketing, under the direct supervision of the parties in interest, is the keystone. By grouping the growers representing each industry together under one head, and then grouping the whole under one system, separately and yet unitedly, the producers would be masters of the situation and the arbiters of their own destiny. They could command the markets; see that they were constantly and fully supplied with California products without glutting; avoid competition among themselves, and thereby secure the best possible results. We cannot here enter into a detailed outline of the system referred to, but submit whether the State Board of Horticulture could not well afford to inaugurate measures calculated to overcome the evils of the commission system as applied to the marketing of the products of the State, even though it be to the partial neglect of measures intended to eradicate other pests that prey upon her industries. We shall patiently await the decision of that body as to whether it be wise to neglect the one and pursue the other.

It may be said, however, that this does not come within the scope or duties of the State Board of Horticulture. If this be true, it is certainly not beyond their consideration and recommendation. What has been said concerning two of the vital industries of the State will apply with equal force to others as to conditions and remedy. When the present output and existing conditions are coupled with what confronts us as to production it does not require extraordinary foresight to forecast the result, unless something be done speedily to bring the marketing of our products to a systematic basis.

FREE PUBLIC MARKET.

The question of establishing in San Francisco a free public market for the sale of perishable products had been under discussion by several fruit associations, granges, etc. Numerous petitions were presented to the Board of State Harbor Commissioners asking for the setting aside of part of the waterfront for the establishment of a public wholesale market for perishable products, where any producer may sell or have sold his products by any agent of his choice. While the Harbor Commissioners signified their willingness to assign the necessary space and to coöperate in all ways possible, they required that the producers, through some organization of their own, have the detailed management of the market, subject, of course, to such regulations as the Commission may approve. No further action was taken until this Board considered the advisability of establishing said market and issued a call for a public convention of fruit-growers and others interested, to meet in San Francisco, April 16, 1896, to determine the question, and

which convention was largely attended by representative fruit-growers, farmers, etc. After a thorough discussion, the following resolutions were adopted:

Resolved, By this convention of fruit-growers, and others interested in the sale of perishable products to the San Francisco markets, that we favor the concentration of the trade from first hands in products coming to San Francisco, at some suitable place upon the waterfront, in a free market under the jurisdiction of the Harbor Commissioners, and that in our judgment the following are essential features to the success of said market:

First—It must be the usual and ordinary terminus for perishable products of all transportation companies, at which all such products will be delivered, unless otherwise ordered by the shipper.

Second—The sale must be conducted under such regulations as shall insure to all shippers the opportunity to know, without expense to themselves, whenever they may so desire, the particulars of the disposal of their products.

Third—To accomplish this purpose there must be a competent inspection under the control either of the Harbor Commissioners or a State organization of producers.

Fourth—There must be the authority to levy upon all produce delivered to the market whatever additional tolls to those now paid, which may be required to defray the expense of proper supervision.

WHEREAS, The California Fruit Exchange having been recognized by special and regular annual conventions of fruit-growers as the authorized representative of the fruit-growers of California for all purposes connected with the marketing of fruits; and whereas, the said Exchange is, in our judgment, the proper body to inaugurate and conduct the proposed free market; therefore, be it

Resolved, That the California Fruit Exchange be and is hereby requested and authorized to immediately take up the subject of the inauguration of a free market for perishable products, and complete all necessary arrangements for its establishment and conduct on the lines indicated by this convention.

Resolved, That a committee of five be elected by this convention to confer with the Directors of the California Fruit Exchange for the purpose of securing representation on its Board, of producers of perishable products other than fruit, and we recommend suitable persons for those positions.

A committee of five was appointed, in accordance with the resolutions, who had the establishment of the proposed fruit market in charge, but afterward reported it could not, at this time, harmonize the conflicting interests, and the project therefore is still in charge of the committee, who it is expected will soon submit a plan of organization through which it is hoped the market may be established.

SHIPMENTS OF 1895.

The fruit output of the State in 1895 was cut short to a considerable extent by late frosts, but while some sections suffered considerably, others were not harmed, which accounts for the large bulk of the fruit they shipped through the season, as shown in the tables on fruit shipments, given below:

	1895.	
	By Rail.*	By Sea.*
	Carloads.	Carloads.
Fresh deciduous fruits	6,625.4
Dried fruits	6,132.6	60.0
Raisins	4,538.5	4.8
Nuts	323.4	1,010.0
Canned fruits	3,129.5
Citrus fruits	11,582.5
Vegetables	3,613.6	40.0
Total carloads	36,045.5	1,114.8
Total by rail and sea	37,160.3.	

* Statistics collected by Gen. N. P. Chipman, in report to State Board of Trade.

The following table shows the total amount (in pounds) of orchard and vineyard products East-bound by the Southern Pacific Company* lines during the year 1895, from territories named:

Products.	San Francisco.	Oakland.	San José.	Stockton.	Sacramento.	Marysville.	Los Angeles.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Brandy	2,684,610	25,920	77,500	769,520	504,580	694,110	168,070
Wine	64,359,320	1,791,990	6,265,710	6,274,290	29,309,990	695,790	4,042,910
Canned fruit	23,071,670	5,906,990	11,976,340	267,720	10,362,900	7,056,820	2,888,700
Canned vegetables	498,720	305,320	283,080	400,170	153,230	24,000	60,910
Fruit, dried	9,194,020	690,130	8,198,300	12,767,770	3,797,780	6,522,670	5,935,530
Fruit, dried figs	51,620	1,930	1,060	1,211,820	29,530	12,360	3,680
Fruit, dried grapes	83,450	-----	340	603,300	84,390	59,280	77,720
Fruit, dried prunes	2,268,910	633,920	43,549,800	2,280,460	7,261,180	1,055,250	2,394,260
Fruit, green (citrus)	45,990	-----	-----	1,185,250	328,770	1,157,500	94,167,180
Fruit, green (deciduous)	131,090	5,534,890	19,854,310	14,879,960	72,494,920	4,438,340	847,480
Raisins	907,720	100	23,990	84,133,610	1,385,860	441,090	1,303,960
Nuts	121,980	2,100	24,300	690	2,370	380	75,290
Nuts, almonds	829,860	121,690	244,760	86,690	557,080	659,240	64,250
Nuts, walnuts	97,320	300	100	23,410	890	210	1,772,150
Onions	564,940	-----	23,150	1,209,880	848,280	48,230	497,740
Potatoes	6,770,760	32,500	1,846,690	1,081,660	6,506,660	616,330	3,091,990
Vegetables	8,673,050	-----	78,290	204,810	3,373,660	252,150	7,598,040
Totals	120,344,920	15,047,780	91,940,560	127,371,010	142,001,970	23,773,760	124,947,860

*Table of shipments furnished by Mr. C. F. Smurr, General Freight Agent S. P. Co., to whom we are greatly indebted for same.

The following table shows the total amount of orchard and vineyard products East-bound by the Southern California Railway Company,* from territories named, for the year 1895, ending December 31:

Products.	Los Angeles County.	Orange County.	Riverside County.	San Bernardino County.	San Diego County.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Oranges	34,167,000	16,107,000	59,451,000	18,396,000	1,407,000	129,528,000
Lemons	1,344,000	378,000	483,000	1,953,000	1,071,000	5,229,000
Vegetables	20,746,000	5,236,000	726,000	682,000	242,000	27,632,000
Green and dried fruits.	10,248,000	4,098,000	1,440,000	7,632,000	552,000	23,970,000
Raisins	748,000	700,000	1,125,000	1,075,000	1,675,000	4,575,000
Honey	748,000	286,000	1,034,000	572,000	1,012,000	3,652,000
Grain	20,032,000	31,040,000	14,976,000	544,000	7,008,000	73,600,000
Wine	4,004,000	132,000	-----	1,452,000	154,000	5,742,000
Wool	480,000	705,000	450,000	-----	405,000	2,040,000
Totals	91,769,000	58,682,000	79,685,000	32,306,000	13,526,000	275,968,000

The North Pacific Coast Railroad Company† carried over their lines in 1895:

Butter	4,061,380 lbs.
Vegetables	4,266,213 lbs.
Fruit	1,556,868 lbs.
Total	9,884,461 lbs.

XII.

ZANTE CURRANTS.

CASE BEFORE UNITED STATES COURT—DECISION, ETC.

One of the most important cases affecting the raisin product of our State was brought before the United States District Court, to compel the importers of this raisin to pay the regular import duty,* and was decided in accordance with the facts involved, much to the advantage of California raisin producers.

From the decision of the court the following points, as seem most directly interesting to our producers, are given:

The Points Involved.—The Collector of Customs claims that the currants in question are Zante currants, and that they are expressly included in paragraph 217 of the present Tariff Act, which reads as follows: "Plums, prunes, figs, raisins, and other dried grapes, including Zante currants, 1½ cents per pound." The importers contend that the currants are not Zante currants, but that they are provincial currants—that is, that they came from Patras, Greece, on the mainland, and not from the Island of Zante, and are covered by paragraph 489, which places on the free list, "Fruits, green, ripe, or dried, not especially provided for in this Act."

The Evidence Taken in New York.—The evidence now before the court for its consideration consists (1) of the testimony and exhibits introduced before the Board of General Appraisers and incorporated in their return to the order of this court of July 17, 1895, directing them to transmit the record of said matter and the evidence taken by them therein, together with a certified statement of the facts involved in the case and their decision thereon; (2) of the testimony and exhibits introduced in this court before the special referee in San Francisco.

Without entering into a minute consideration as to the effect and sufficiency of the evidence taken before the Board of General Appraisers at New York, it is sufficient to say that it is completely overcome by the evidence taken in this court before the referee. Eight witnesses were called by the protestant in New York. Several of them professed to have more or less knowledge concerning Zante currants, but none of them appeared

* Furnished by Mr. C. B. Whitehead, Auditor Southern California Railway Co., whose aid we acknowledge with thanks.

† We are indebted for these figures to Mr. W. F. Russell, General Freight Agent.

to be experts. They certainly were not expert viticulturists or horticulturists, nor, so far as their testimony shows, had any of them made a special study of the Zante currant, or of currants in general. Several of them admitted that they were not experts and knew but little about Zante currants. Such knowledge as they did possess appears to have been acquired in the course of dealing in dried fruits and by reason of importations made of currants, and while sufficient for the ordinary purposes of trade, it cannot be said to be sufficiently competent to be accepted as binding expert testimony.

Four of the witnesses identified a sample of the importation as being, not a Zante currant, but a Patras currant from the mainland. Four other witnesses testified that the expression "Zante currants" was understood to mean currants from the Island of Zante alone, and not from the mainland. All these witnesses were subjected to little, if any, cross-examination. One witness in the course of his examination stated that a Zante or Patras currant was a fruit other than a grape. This was clearly an error, and is completely and conclusively overcome and refuted by the unanimous testimony of all the witnesses, both for the Government and for the importers, who testified in court before the referee.

The Evidence Taken in San Francisco.—The testimony taken before the referee is in marked contrast to that given before the Board at New York. The witnesses, on the part of the Government—some twenty-three in number—were experts in every sense of the word, and proved themselves thoroughly conversant with the Zante currant, not only botanically, but commercially as well. Some of them testified that they had made experiments in the growing of Zante currants in this State. They were subjected to a rigid cross-examination. The protestant produced but three witnesses, one of whom was the importer, and all of whom displayed a conspicuous want of knowledge upon the subject. Such opinions cannot stand as against the positive statements of the experts in the case, who have made the question one of actual study, observation, and experiment. It would prolong this opinion to an unwarrantable length to rehearse the testimony given. It predominates largely to the effect that "Zante currants" is a well-known commercial expression among importers, dealers, and growers of raisins, and relates to and comprehends a kind of raisin made from a small, seedless grape grown not only in the Island of Zante, but also, and to a much greater extent, on the mainland of Greece and other neighboring localities. "Zante currants" is simply its English name. It derives the name of "currants" from the fact that, in times past, it was shipped from the City of Corinth, Greece.

Findings of Fact.—The court went into a lengthy discussion of the origin of the term "Zante currant," the growth of the Zante currant trade and present status of the trade, and its significance commercially. He concludes on this point: "Without going further into the evidence, it is enough to say that, as a whole, the following four propositions of fact were, to my mind, conclusively established: First, that the currants, comprising the importation in question, of which 'exhibit 1' is a sample, are Zante currants; second, that Zante currants are a kind of raisins; third, that Zante currants are grapes dried; and fourth, that Zante currants are not the product exclusively of the Island of Zante, but they are produced also on the mainland of Greece, in the archipelago and other places, and in much larger quantities than on the island. Being Zante currants, they come within the language of paragraph 217, as above set forth, and are subject to the duty of 1½ cents per pound therein prescribed."

The court discussed at considerable length the claim of counsel for the importers that the use of the word "Zante" indicates that Congress meant to limit the imposition of the duty on currants produced only in the Island of Zante, and that, as the importation involved in this case came originally from Patras, in Greece, on the mainland, and is a product of the provinces of Greece, therefore it is not subject to the duty imposed by paragraph 217, but, on the contrary, it is entitled to free entry, under paragraph 489, which exempts from duty "fruits, green, ripe, or dried, not especially provided for in this Act."

All Greek Currants Are Zante Currants.—The Court shows by the citation of numerous authorities that, in interpreting a name or expression applied to articles upon which duties of importation are laid, it is well settled that Congress uses such terms in their ordinary commercial sense rather than in their distinctive or technical sense. He continues:

"The Tariff Act, in the enacting clause, applies to 'all articles imported from foreign countries.' As a matter of fact, the evidence tended to show that much larger quantities of Zante currants, so called, are grown and exported from the provinces of Greece than from the Island of Zante, and that those grown on the mainland are still known commercially in this country as Zante currants. In other words, 'Zante currants' is the generic, commercial term for this species of grape when dried into raisins. It would be unreasonable to suppose that Congress, in imposing duties on Zante currants in the general language employed, intended to tax those coming from the Island of Zante alone, and not those which come in much larger quantities from other localities. Such an interpretation would result in an unfair and unwarranted discrimination between foreign places of produce, which, in the absence of clear and unambiguous words to the contrary, should not be imputed to Congress. It is but fair to assume that, had it intended to limit the imposition of import duties on Zante currants grown and exported from that island only, it would have so stated in clear and plain language."

In conclusion, the Court says: "My opinion is that the classification of the article imported and involved in this case as 'Zante currants,' made by the Collector of the Port of San Francisco, is correct, and that it is therefore subject to the duty prescribed in paragraph 217, of 1½ cents per pound. The opposite decision reached by the Board of General Appraisers is erroneous and should be reversed, and it is so ordered."



AN EIGHT-YEAR-OLD WALNUT TREE.
From the seed; being the age seedling walnut trees begin to bear.

XIII.

CALIFORNIA WALNUT INDUSTRY.

(1) COMMERCIAL IMPORTANCE.

Holding a prominent place among the fruit products of California, stands the walnut. This position has been attained in the past few years and is due to the results of experience—and many failures—which have shown the proper conditions under which this fruit will thrive, its requirements in soil, climate, and location, and the production of varieties adapted to the peculiarities of our State. The old-time saying that the area of walnut culture in the State “is very limited” and confined to any particular section, has, by happy chance, proved a fallacy, and is disproved by the numerous productive orchards that bear witness to its successful culture. While the early plantings were made in the southern counties, where the culture of the walnut is pursued with great magnitude, the industry is gradually spreading and broadening. While the walnut will withstand a very low temperature, it is very susceptible to sudden changes, and a hot day suddenly following a frosty night will chill the young wood, and often proves fatal to a young orchard, setting it back a season’s growth. The same is true in the springtime on the opening of the flowers or catkins—a chill will frequently cause them all to drop and render the crop a failure. For this reason a location free from prevailing frosts, or one where the sun will not strike the trees until the effects of the cold have been overcome, is very desirable. The latter trouble can be largely overcome by planting some of the late blooming varieties, which do not send forth their catkins until danger from frosts is largely past.

California walnuts are fast supplanting those from foreign countries. Only a few years ago the growers of these nuts here had a very hard struggle to introduce them, being obliged to accept the humiliating price of from 3 to 6 cents a pound less than that paid for imported walnuts. Gradually, however, a reduction came, in favor of the California product, and now Eastern dealers will take our best walnuts at prices equal to, and in many cases exceeding, those obtained for those coming from abroad. Our State affords a splendid field for the walnut industry, and although thousands of trees have been planted and the acreage is being extended every year, it is believed that overproduction need not be feared. Our producers have all America for a market, and they are not slow to appreciate the advantages of their position.

(2) THE “ENGLISH” OR “PERSIAN” WALNUT.

The walnut (*Juglans** *regia*, Linn.) is a native of Persia, and is supposed to have been introduced into our State by the Franciscan monks during the establishment of the California Missions in 1769. Records of its early history are scant, but mention is made of walnut trees

* *Juglans* is a genus of trees consisting of six species; three are natives of the United States, viz.: *J. nigra*, or black walnut; *J. cinerea*, or butternut, and *J. fraxinifolia*, or ash-leaf walnut. The other three species are *J. regia*, “English” or “Persian” walnut; *J. pterocarpa* grows on Mount Caucasus, and *J. baccata* in Jamaica and Spain.

growing about the Missions by most of the writers in the "Record of the Founding of Missions," and the "History of Franciscan Missions of California," and, therefore, it is safe to assume that with the advent of the Missions dates the introduction of this valuable tree. In the Mission yards are yet to be seen walnut trees of those early plantings, and while age began to tell on these many years ago, they still live and bear nuts, but few in number and small in size.

* "When I first arrived in Los Angeles, in December, 1854, there were numerous small bearing 'English' walnut orchards and sundry isolated *large* trees which could not have been less than ten years old, and some of which must, I am confident, have been more than twenty-five (25) years old.

"In talking to-day with Mr. Stephen C. Foster, he fully corroborates my view, that the English walnut was first brought to Los Angeles, or to California, by the Missionary Fathers, or by individual laymen during the missionary era. Mr. Foster says that when he came here, in 1847, there were several large English walnut trees here, that he is certain were not less than twenty years old. One of these was on the old Pryor place, on Alameda Street, which I remember well, and another on the old Louis Vigne property, etc., which would make their planting extend back to 1827, or before. So that I think it would, without doubt, be historically true to say that the cultivation of the so-called 'English' walnut was commenced in California as early as the first quarter of this century (and possibly still earlier) by the Mission Fathers, or under their patronage and encouragement.

"It would have been a very easy and natural thing to do, for persons coming here by sea to have brought a few walnuts, and for the Friars to have planted some of them. What could have been more natural than for the priests or other officials, civil or military, who came from Spain, to desire to raise, in this fertile country and mild climate, all those useful fruits and food products that they were familiar with in their native land? We are all compelled to admire the practical forethought of the organizers of even the very first expedition in 1769, Galvez, Serra, etc., in this respect."

The most careful research as to the early walnut plantings has been made, showing that among the first walnut orchards of early history, planted outside of the Missions, were those of the late Col. J. J. Warner, in San Diego (supposed to have been planted in 1843, on a ranch named after him and which name it still bears—"Warner's Ranch"), the Pryor, Vigne, Wolfskill, Dalton, Boyle, Shaw, Childs, and Briswalter orchards at Los Angeles, the Temple orchard at La Merced Ranch in the San Gabriel Valley, the Heath orchard at Carpinteria, and the Wilson and Kewen orchards at San Gabriel. A small planting was made in 1846, near Calistoga, by Frank E. Kellogg, Sr. The largest of these plantings are the Heath, Briswalter, and Temple orchards. The Briswalter is of most recent planting; the Heath orchard is the largest in the State of early history. It is impossible to ascertain the exact years these orchards were planted, as all the persons above mentioned (excepting Mr. Heath) have since passed away. These orchards are said to have been set out from 1850 to 1865; however, the only authoritative information I can find is the statements of several persons, whose minds are not clear as to the exact time.

† "In 1858, the year I obtained my walnut seed of Mr. Wolfskill, of Los Angeles, I had no knowledge of walnuts being planted in this State, except those planted by the Mission Fathers. The trees from which my seed was taken were planted by the Franciscan Fathers. The Wolfskill place, in Los Angeles, was an old garden of the Mission. Mrs. Wolfskill was a native Spanish lady of Los Angeles, and informed me that the vineyard and walnuts were bearing when she was a small child, in fact she did not know the age, they were large trees. Judging from the oldest trees I have at present, I think those walnut trees must have been over fifty years old in 1858. I made inquiry for walnut trees with the view of purchasing, and could not find any one who had tried their culture except the Mission Fathers. I was advised to plant walnuts by Reverend Father Gonzalez, head of the Franciscan Missions, who resided for many years in Santa Barbara. From him I obtained much of its history taken from documents in his possession. The

* Letter from H. D. Barrows, a pioneer, February 29, 1896.

† Letter from Hon. Russell Heath, of Carpinteria, February 27, 1896.

nuts were brought from Spain, first planted in Mexico, and taken from there to South America. The first planting in California was at San Diego; two at San Gabriel, Los Angeles County, three in Los Angeles. From my information, I think the Wolfskill place was one of the first planted in what is now the City of Los Angeles. After the Mission at Santa Barbara was established, there was a propagating garden established and seeds and plants brought from the Mission south. Father Gonzalez told me no walnuts were planted, but almonds were, but they were not considered a success and were abandoned, while the olive, grape, fig, pomegranate, and some other fruits were cultivated with great success. There was no record of the walnut having been planted north of the Mission of San Buenaventura, where I saw for the first time a walnut tree in 1852."

* "Father never spoke to me of the 'English' walnut orchard that was set out; but speaking to Don Ramon Valenzuela, who was in father's service in 1849, he said that in that year he plowed the orchard, and that then a few of the trees were commencing to bear. As you know how long it takes the trees to bear,† you can judge how old they were at the time. Don Miguel Pryor had just one walnut tree older than ours, but father was the only owner of an orchard at the said time."

† "I think Mr. Wolfskill's orchard (now dug up and land turned into streets and building lots) had been planted at least ten years at date of my arrival here, last of 1854, and Mr. Elijah Moulton is of the same opinion. Mr. Coronel, Colonel Warner, and Governor Pico would probably have known, but all three of them have died within the past two years. The Andre Briswalter walnut orchard of 1,000 trees must have been planted, I think, as early as the 60's, if not in the late 50's. J. R. Barton, Sheriff, had planted a walnut orchard on his ranch at Los Nietos River before he was killed by the bandits in January, 1857."

In almost every county of the State are found large walnut trees showing great age, planted very irregularly among other trees, indicating that no attempt had been made to produce a walnut orchard by itself, but were planted by the growers to experiment as to their growth and to furnish walnuts for the table.

At Knight's Ferry, Stanislaus County, is a seedling walnut tree of enormous size, the property of Asa Collins, planted by W. E. Stewart in 1858. The seed was brought from France by a French sailor. Out of the three walnuts he brought only one grew, which is the parent tree of many plantings.

§ "In 1873, Mr. Finch, of Alameda, ordered from Messrs. Rose & Grant, of Topeka, Kansas, fifty trees of a so-called 'Persian' walnut, introduced by them from Persia, one year old, which sold for \$10 each. The order could not be filled, so he only obtained thirty-six, of which Mr. Latham bought ten, Mr. Selby two, J. D. Roberts four, and Wm. Meek twelve. The sale of the balance was withheld."

¶ "Mr. D. C. Vestal has a walnut tree at San José, about sixty feet high, bearing medium thin-shelled nuts. The nuts from which this tree was produced came from Chile, and were planted about thirty years ago by Mr. Vestal, where the tree now stands. He has gathered from it yearly about a barrel of nuts."

In 1883, Mr. Kelsey, of Fresno, reported to the State Horticultural Society that he had at Fresno two trees of the so-called "English" walnut, that were then about six feet in circumference and about fifty feet high.

|| "At Mud Springs, El Dorado County, are to be seen several large 'English' walnut trees."

In Winters, Solano County, at the John Wolfskill place on Putah Creek, are many large trees that yearly produce medium-size nuts of fair

* J. W. Wolfskill, letter of March 13, 1896.

† Trees of this so-called "English" walnut come into bearing at the eighth year from the planting of the seed; therefore, the orchard must have been set out about in 1841.

‡ H. D. Barrows, letter of March 14, 1896.

§ Pacific Rural Press, 1873, p. 193.

¶ Proceedings State Horticultural Society, April 27, 1883.

|| Pacific Rural Press, 1871, p. 460.

quality; these, however, were grafted on the black walnut, and are about thirty years old.

* "My father, F. E. Kellogg, settled in Napa Valley about midway between the present towns of St. Helena and Calistoga, in 1846. In 1848 he planted some walnuts in his nursery. When the trees were two years old (in 1850) he planted them about his doorway (ten or twelve in number), where some of them remained for more than forty years. From time to time, father added to the number of his walnut trees, but never planted a very large orchard of them. Some of the trees in my orchard here in Santa Barbara County are from nuts taken from the old trees in Napa Valley."

The largest walnut orchard of early planting in the northern part of the State is located near Los Gatos, in Santa Clara County; it is about thirty years old, and produces fair crops yearly. The largest orchards of recent planting are in Lake and Sonoma counties. In San Lorenzo, on the Wm. Meek estate, is an extensive walnut orchard of early planting. In Sonoma, at the Vallejo place, and at Mission San José, are many walnut trees that show great age and are healthy in appearance. General Bidwell, at Chico, has a considerable number of walnut trees, all vigorous and fruitful. Many such trees are to be found in Napa, San José, Santa Clara, Merced, Modesto, Fresno, and Visalia. Along the coast in almost every county are to be seen large walnut trees of early planting. While these early plantings were small and many consisted of isolated trees, as were those in the Mission gardens, yet those trees mark a special epoch in the horticultural history of our State, as they have proved the great longevity of the walnut and enlightened the growers as to their culture and future possibilities.

(3) LONGEVITY OF THE WALNUT.

The great and prodigious age attained by the walnut can only be conceived from records of its early history. All the early botanical writers—English, French, Italian—point out the fact that the walnut, in their respective provinces, does not bear until it has reached the age of fifteen to twenty-four years, and hardly becomes a paying investment until it attains a prodigious age. In California, the walnut begins to bear at the eighth year from the seed, and from that time on the crop increases, and the orchards become remunerative. It is now not uncommon to see walnut orchards from thirty to forty years old, in the prime of health, producing every year bountiful crops.

† "In Persia, the tree comes into bearing at eight years from the planting of the seed; in Italy, Spain, and the Island of Madeira, in about sixteen years; in France—the southern part—in eighteen years; in England, in twenty-four years, and in California in eight years, the same as in Persia. So, I take it, the southern part of this State is nearest its home."

‡ "After fifteen or twenty years from the time of planting, the walnut gives only hopes, so to speak, for its yield is yet so small that its value can hardly be reckoned; it is only from thirty to sixty years that this tree can offer each year a product sufficient to increase the income of the landlord. It takes a century, and over, before the wood is good to be used in the arts."

§ "Walnut trees are spoken of that bear, in good years, 50,000 to 100,000 nuts; such trees are truly very rare, and their trunks are not less than 15 to 20 feet in circumference."

* Frank E. Kellogg, of Goleta, letter of March 12, 1896.

† Hon. Russell Heath, in essay before Eleventh State Fruit-Growers' Convention, 1889.

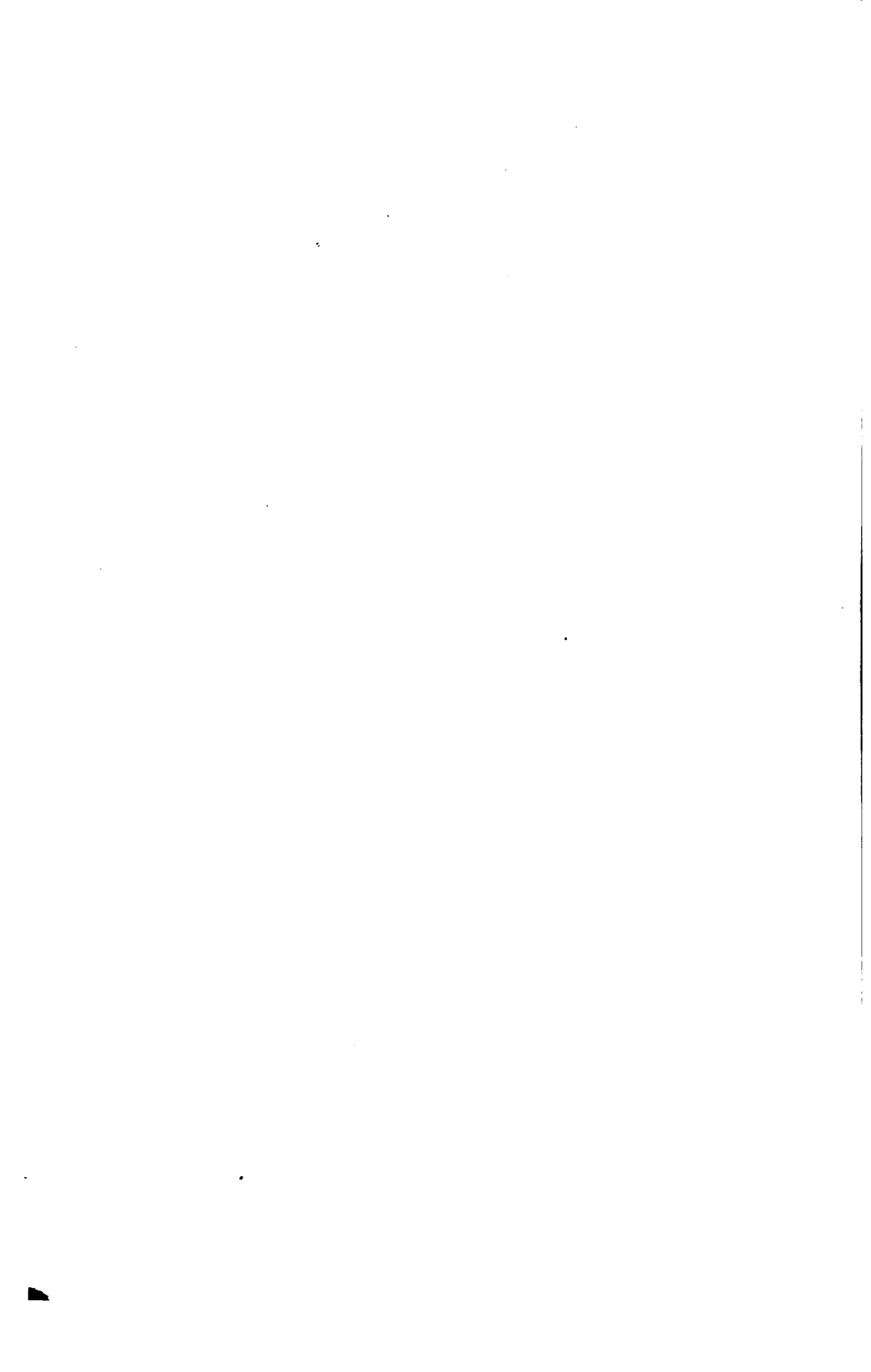
‡ Maison Rustique, Vol. 2, Chapter XII.

§ Maison Rustique, Vol. 2, p. 143.



WALNUT BRANCH.

Showing development of male flowers, or staminate catkins, with the first period of growth two weeks before the appearance of the female flowers or pistillates.





WALNUT BRANCH.

Showing both staminate or male catkins and pistillates or female flowers in full bloom, having appeared together, or nearly so. The male organs or catkins emanate from the bud-cells in the axils of the leaves on twigs of the preceding summer, and the female flowers at the terminals of the new growth, with the embryo nuts.



WALNUT BRANCH.

Showing male flowers or staminate catkins after blooming, and the female flowers or pistillates (and embryo nuts) above, just in bloom, having made their appearance two weeks later, and ready for fertilization.

*"In the village of Beachemwell, in Norfolk, may be seen a walnut tree (*Juglans regia*) which spreads its 'softly swelling hills' of leaves over the church-yard of All Saints Church, now in ruin, as if it sought to mingle leafy dust and human ashes. When this tree is arrayed in all its honors 'fresh and green' it is an object interesting by its symmetry and gigantic proportions. The crumbling walls of the ruin, throwing their shadow far away and standing out in gray relief from the green turf, beneath which the good forefathers of the village sleep in peace, offer a striking contrast to the huge mass of walnut foliage, presenting a specimen of its kind seldom equaled. This tree has produced in one season 54,000 nuts, and its dimensions are as follows: Circumference of the body of the tree near the ground, 32 feet; height of trunk, 10 feet; the circumference of the five large branches is 16 feet, 14 feet, 9 feet, 8 feet, 8 feet; the circumference of the extreme spread of the tree is 120 yards, and its estimated height is 90 feet."

† "On the road from Martel to Gramat (Lot) is to be seen a colossal walnut tree at least three hundred years old. The height of this tree is about 55 feet; its branches extend to a distance of 125 feet; the trunk, 14 feet in diameter, is only 20 feet high, but it sends out seven immense branches. It bears on an average each year 15 bags of walnuts."

‡ "An Italian architect mentions having seen at St. Nicholas, in Lorraine, a single plank of the wood of the walnut, 25 feet wide, upon which the Emperor Frederick III had given a sumptuous banquet. In the Baidar Valley, near Balaklava, in the Crimea, stands a walnut tree at least 1,000 years old. It yields annually from 80,000 to 100,000 nuts, and belongs to five Tartar families, who share its product equally."

(4) POLLINATION.

Until recent years no attempt was made to improve the varieties of the walnut in cultivation by cross-pollination, but the universal practice has been to plant the nuts selected from fruitful and rapidly growing trees, and the seedlings grown therefrom, on not becoming regular bearers, were dug up, as were also all trees producing inferior nuts. Trees producing nuts deficient in kernels were not uncommon, but were frequently reported, and many such trees still exist. From past experience it is readily to be seen how important it is for the grower to study and know the varieties, so as to plant and locate them in the orchard so that they may assist in the pollination of one another. In fact, the study of pollination becomes essential as the first step to successful fruit culture.

In all catkin-bearing trees—as the walnut—or of monœcious flowers, the flowers necessarily differ and have their sexes separated, but are borne by the same tree. The incoherent pollen is produced by the male flowers (pendulous green cylindrical catkins), which is distributed and comes in contact with the female flowers by the aid of insects, the air and wind, by fall of gravity, or by friction, thus insuring a crop. The male flowers, or staminate catkins, are the first to appear, and come out generally together with the first growth of the tree, although in many instances they appear before the trees put forth, but about the time they begin to show signs of growth. The female blossoms, or pistillates, appear much later, from one to three weeks intervening. In some of the European varieties the difference is very slight, the pistillates appearing about the time the staminate are in full bloom. Instances of this nature with the "English" walnut are very rare.

The male flowers, or staminate catkins, after blooming lose hold and drop, and, coming in contact with the limbs, thus distribute their pollen amongst the foliage of the trees. The pollen is also distributed and

* Gardener's Chronicle, London, 1857, p. 694.

† Gardener's Chronicle, London, 1852, p. 568.

‡ Gardener's Chronicle, London, Vol. VII, 1877, p. 310.

adheres to the limbs and leaves during the blooming period of the male catkins. The fertilizing power of the pollen is not lost, but is preserved for an indefinite period, and a mere speck falling on the stigma of the female blossom is ample to render it fertile.

In many instances it has been observed that some trees will produce at times an abundance of flowers of one sex, and few or none of the other sex. Trees—as the walnut—that mature their pollen before the female flowers on the same tree are ready for fertilization, are called by botanists *proterandrous*; while others, called *proterogynous*, have their stigmas mature before the pollen is ready. The purpose of this curious functional difference obviously is in favor of cross-fertilization, by pollen, of flowers borne by other trees of the same species.

According to the *Gardener's Chronicle*, in 1888, reports became current of trees in portions of the walnut sections of France bearing a full crop, but the nuts failed to harden, the husks when about half grown withering up, and few good nuts were found. The kernels which were formed were soft and insipid. Reports made throughout were that "while there were plenty of nuts there was nothing in them," and after assigning different reasons for this failure, conclude "probably from imperfect fertilization of the flowers." Many other similar instances are reported as occurring in different groves.

* "It is a common occurrence for the walnut to be deficient in producing either the male or female blossoms, which it bears, both of which are essential to its producing and ripening nuts. I have a tree, now about twenty years old, which began a few years ago to show blossoms, but those merely female, without one male catkin appearing on the tree, and the consequence has been that after the flowers faded the fruit regularly dropped off. This season, there being a considerable show of female blossoms but no male ones, I thought of trying the plan followed by gardeners in the case of melons and other fruits where fertilization is not freely effected by nature, and having seen abundance of male catkins on a tree at a friend's, I asked him to send me some, and he accordingly sent me a small paper-bag full, which I dusted and threw over such of the female blossoms as were within my reach. The consequence has been that I now have about a dozen fine nuts, swelling out regularly, with every appearance of coming in due time into maturity. All the embryo fruit not fertilized have fallen off as usual. I am pleased with the success of my experiment, and mean, should my tree still prove deficient in male blossoms, with the assistance of my friend's, to supply its wants, and, by taking a little more trouble, I have no doubt I shall be able to render every female blossom fruitful."

As showing this curious functional difference in our own State, a few facts are cited. A nurseryman at Ventura observed a large seedling walnut tree, which, from its luxuriant growth and symmetrical form, he believed would be a variety worthy of cultivation. Accordingly, in the spring of 1886, he planted forty pounds of nuts gathered from that tree. When the seedlings bore, none of them produced nuts of any commercial value. This, of course, proved to be a sad disappointment to him, and, after waiting ten years for a crop, he dug up most of them. Some of the trees had become of large dimensions and had long, spreading branches, and were always quite full of nuts, but without kernels—all hull and shell. This functional difference was investigated; the trees were found to produce an abundance of flowers of the same sex, but few or none of the other, through which imperfect fertilization of the flowers the kernels in the nuts did not form—they were wanting. It is also interesting to note that no attempt was made to correct this curious phenomenon by artificial cross-pollination, by distributing pollen from staminate catkins, or male flowers, of other trees, before digging up the trees.

**Gardener's Chronicle*, London, 1847, p. 541.

Through the continuous planting of the seed (as mentioned elsewhere), without regard to the laws of nature, has come about the degeneration of the species in many sections. Trees are frequently reported as having "never borne nuts"; others "bloom profusely, but are blooms of only one sex; the nuts have never set, and have become a barren waste." This is a summary of the reports that have been continuously received for years past. In recent years more attention has been paid to the morphology of the walnut, and it is now better understood.

*"I have a few trees of the ordinary 'English' walnut. In 1878 the staminate blossoms came out in the latter part of March; they dropped off and perished on the ground. About the 15th of April the pistillates made their appearance. The result was the nuts dropped off. The next year the staminates made their appearance the 1st of April; they dropped off by the 10th, and between the 12th and the 15th the pistillates made their first appearance. The result was I had no walnuts. The next year, 1880, I found that the blossoming period came closer together, within a few days. About the 1st of April the staminate blossoms dropped off, and in a few days the pistillates began to make their appearance. I looked over the trees and found a few stunted staminate blossoms. I gathered them very carefully, and shook them over the trees. The result was that every tree over which I distributed the pollen was laden with walnuts."

Incidentally, I may mention that almond-growers were in a worse predicament, and in many sections the culture of the almond was abandoned. The Languedoc, a variety first introduced, was found to produce an extraordinarily large number of flowers of one sex, and few of the other. The morphology of the almond was studied, with wonderful results, and many of these same localities are again planted to the almond, and are among the leading almond-growing sections of the State. It was also found that by planting different varieties in an orchard alternately, the pollen would intermix and aid in the setting of the fruit. This, however, was done in many cases without studying their blooming period, and consequently failure resulted. For instance, seedling trees of the bitter almond were planted in the orchard, as they were profuse bloomers, but the time of blooming was not considered. Seedling trees of the bitter almond are among the first to bloom, and put forth two weeks or more ahead of the standard varieties, so that when the latter came into bloom the pollen of the bitter almond had either been washed off by the early rains, or lost through other unfavorable conditions, preventing its action on the other flowers. In order to accomplish the results aimed at, the varieties so intermixed must bloom together, or nearly so. I know of no instance where this has been tried on the walnut, but it is certainly worthy of trial, as it may tend to correct this curious phenomenon, prevalent among some of our walnut orchards complained of, consisting of trees grown from seed. Of course, with the almond the experiment was much easier, because, after testing a certain variety, and its merits becoming fully known, they were reproduced by budding. The long period required by the walnut to come into bearing was a bar to any experiments in this line, and it was grown from the seed almost altogether. But this is no longer so. Fruit culture has reached the height of perfection, and is now being conducted on broad lines and scientific principles. Inferior seedlings are giving way to grafted and budded trees of the choicest kinds, or to seedlings of choice selection; their habits are studied, and the novice or the grower does not have to wait and undergo years of toil and anxiety to acquire

*W. H. Jessup, of Haywards, in essay read before State Horticultural Society, April 27, 1883.

results, but can profit by the experience of others who have made fruit culture the study of their lives, and who show their liberality and warmheartedness by sharing this knowledge with their neighbors.

(5) ORIGIN OF IMPROVED HOME VARIETIES.

While large walnut orchards were set out, and many new plantings made every season, consisting mainly of seedling trees produced from seed from the old historic trees of early introduction, no attempt was ever made to produce improved varieties by cross-pollination, and none are yet recorded. Only recently have improved varieties become known, and these originated from chance seedlings. In 1867, Mr. Joseph Sexton, of Goleta, Santa Barbara County, purchased in San Francisco a sack of walnuts supposed to have come from South America, labeled "English walnuts," from which he raised about 1,000 trees, and the spring following (1868) planted 200 of these trees in orchard form at Goleta. Sixty proved to be of a soft-shell variety. Later, he planted 24 trees raised from soft-shell nuts from his original trees; of this number 21 came true (the same) to the parent tree, and 3 made a much stronger growth, commenced fruiting in the sixth year, and produced a soft-shell nut, and an improvement over the original trees. The first he named "Santa Barbara Soft-Shell," and the latter "Improved Soft-Shell," by which names they are now known. In 1859, Hon. Russell Heath, of Carpinteria, furnished Mr. Stowe, at Santa Barbara, with a large quantity of walnuts from his orchard of so-called "English" walnuts, for planting. Among the trees that Mr. Stowe raised from that seed, one produced soft-shell nuts. It is Mr. Heath's firm belief that this nut must have come from a chance seedling produced by him from seed which he procured from the orchard of the late Wm. Wolfskill, at Los Angeles, from whom he obtained his first seed. There is no instance on record where any soft-shell walnuts had been produced prior to that time.

Mr. George W. Ford, of Santa Ana, originated soft-shell walnuts, which he christened "Ford's Eureka" and "Ford's Improved Soft-Shell." They were produced from seed grown by Mr. Sexton, of Goleta. Mr. Felix Gillet has originated the "California Paper-Shell," the "Columbus," the "Cluster Præparturiens," and the "Mayette-Shaped Præparturiens." Many other varieties have been catalogued, mostly because they were "new," but were never passed upon by any competent authority, or their merits determined. Most of these trees, on coming into bearing, produced a nut similar to that of the tree from which they originated as chance seedlings. These various types, not being distinctive enough to be classified by themselves, are all labeled "English walnuts."



WALNUT BRANCH.

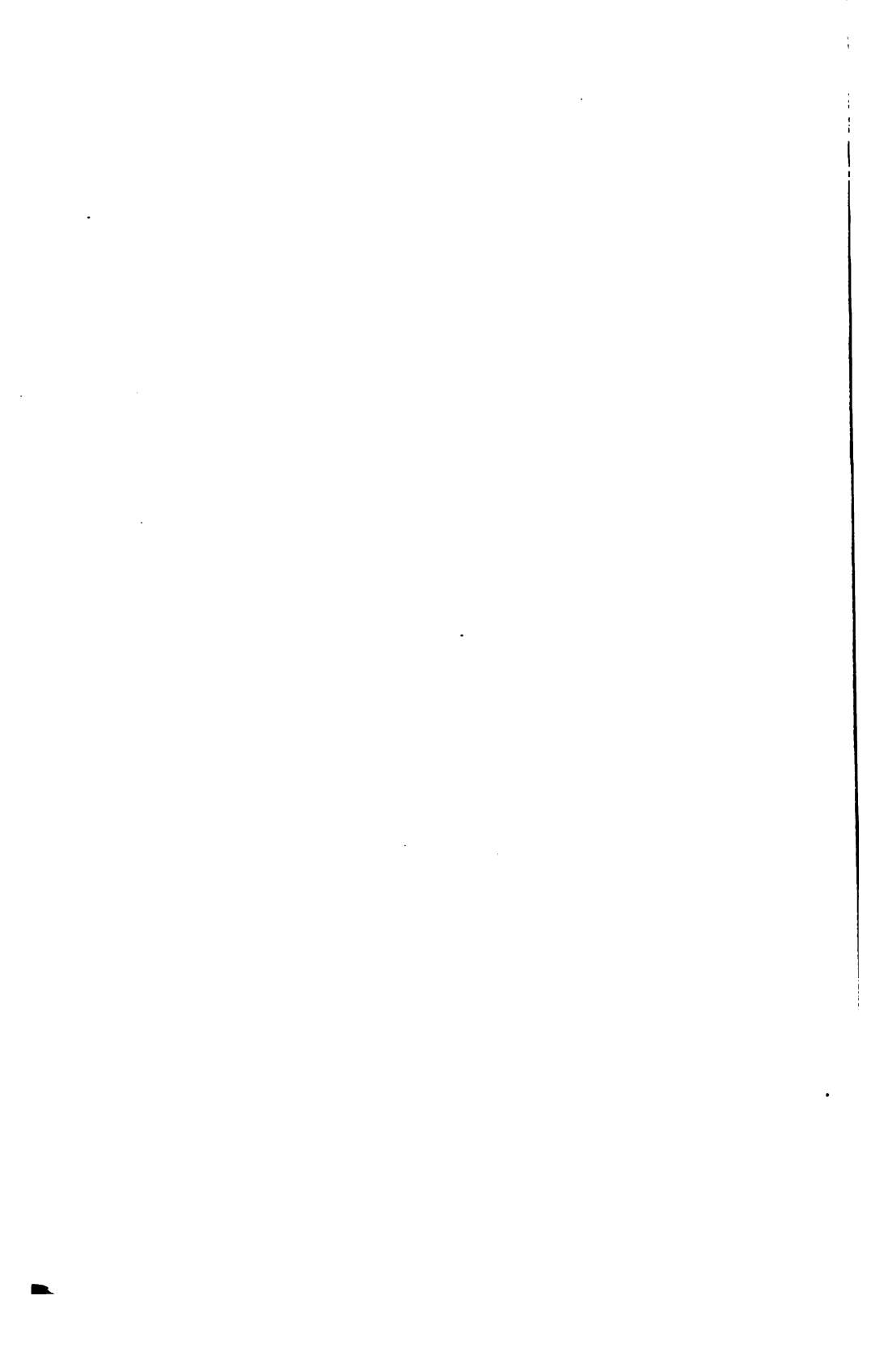
Showing the mature nuts through the cracking of the husks, ready for harvesting.



FIG. 1.—Branch of walnut showing character of growth and an extraordinarily large amount of male, or staminate, catkins; reduced.



FIG. 2.—“Root knot” on young walnut.



(6) VARIETIES OF THE WALNUT (*Juglans regia*, Linn.).

ENGLISH.*

(Plate XXI, Fig. 2.)

Synonyms: Madeira, Naples, Los Angeles, Common, Chile, Mission, etc.

This walnut was the first introduced into our State; from it innumerable varieties have sprung, and of which the principal orchards of the State consist. The name is applied to any variety of the so-called "English" walnut. It would be difficult to determine the particular variety to which this name belongs; however, it is a name applied by common consent to any and all varieties that have originated from the so-called "English" walnut, and really is more of a commercial name through which the product is marketed.

The principal orchards of the State consist of trees grown from seed of the so-called "English" walnut, and while the walnut comes truer to seed than most fruits, it could not be claimed that *all* the orchards of the State are of this particular variety, simply because the trees were raised from seed of the original stock. In almost every orchard of the State of early planting are trees bearing nuts wholly unlike the nuts produced by the parent trees, and they can only be classified as types of the original nut, showing the great variation produced from planting the seed. Many of these orchards, however, consist of types of rare quality, such as the orchards in the Los Nietos Valley, Santa Ana Valley, San Gabriel Valley, Carpinteria, Santa Barbara, etc. While most of the types that originated from the seed grown on trees of early planting produced a hard-shell nut, there were many that produced a thin or soft-shell nut. The best and most productive orchards to-day consist of trees grown from seed of the original trees.

To describe the so-called "English" variety would be as difficult as to describe the seedling orange and its many types. Oranges cultivated from seed are known as "seedlings," but as the seed from these seedlings has been planted continuously, and though the trees so produced bear fruit so distinct and so variable, they are only *seedlings* from *seedlings*, and are accepted under that name without regard to variety.

Among those trees of early history were many that produced large, clear, hard-shell nuts, which were greatly sought in the market. The nuts of this type were in great demand for planting, although by continuous propagation from the seed for nearly a half century, without regard to the degeneration of the species, many of these types have been allowed to degenerate until their cultivation has been almost abandoned.

While seedling trees and small orchards of this so-called "English" walnut, or "Los Angeles nut," are met with in almost every county of the State, the successful culture of this nut and its many varieties has been confined to the lower counties—from Santa Barbara to San Diego. Trees grown from seed of this nut—"English"—in many sections have proved too tender to withstand the cold of winter and the heat of summer.

* For want of a better name, and to indicate the locality from whence it came (as it is supposed by all the earliest British botanical writers to have first been introduced into England by the Romans), it was called commercially the "English walnut."

They generally get cut back by frosts† in the spring, as they put forth too early to escape them. The trees keep growing quite late in the season, and the tender shoots and undeveloped growth suffer from the extreme heat, and are nipped by the frost in the fall.

Of late years several late-blooming varieties produced by chance have come into prominence, having most of the essential qualities required, and which are proving successful everywhere, and will hereafter, no doubt, supplant all others of this species.

While the walnut has reproduced itself, that is, "come the same," from seed, it has a tendency to revert to the wild state, as is the case with all trees when continuously propagated from seed. A variety can only be reproduced and remain constant by budding and grafting. In this State many such instances have been cited and recorded.

EUROPEAN VARIETIES.

The varieties described in this chapter have proved most promising of the numerous kinds introduced into our State in recent years. The descriptions given are by leading growers, whose opinions are worthy of fullest consideration:

Persian.—Generic commercial name, applied by common consent to all varieties of the *Juglans regia*.

* *Chaberte*.—(Plate XXII, Fig. 9).—An old and most valuable variety; late in budding out. The nut is well shaped, roundish-oval, and of fair size; the kernel is of extra fine quality; good bearer. The Chaberte originated in France over a century ago, by a man named Chaberte, hence its name.

"The Chaberte is a good and thrifty variety."—West.

"The tree is very productive, developing its leaves and bloom late in the spring."—Rock.

* *Franquette* (Plate XXI, Fig. 5).—Blooms late in spring. Originated about the same time as the Mayette, in the southeast of France, by a man named Franquet. It is quite large, of an elongated oval, and very attractive; kernel full-fleshed and sweet, and of rich, nutty flavor. It also buds out late in the spring, being as hardy as Parisienne and Mayette. Very desirable as a market nut.

"Nuts very large and long; one of the finest for dessert."—Rock.

* *Mayette* (Plate XXI, Fig. 3).—This is one of the finest dessert and market nuts grown; it is quite large and uniformly so, well shaped, with a light-colored shell; the kernel is full-fleshed, sweet, and nutty. But what renders this valuable kind more valuable yet, is that it is very hardy, being late in budding out, which enables it to escape uninjured the disastrous effects of late frosts in the spring; it is also an abundant bearer. This is the nut imported into the United States under the name of Grenoble, but on account of duties to pay, and the nut being high-

* Described by Mr. Felix Gillet.

† On March 2, 1896, the northern and central portions of the State were visited by a severe frost and snowstorm. On the morning of the 3d I examined the growth of the English walnut in several orchards, which had already grown about 4 to 6 inches, and found much damage done to both the growth and the male catkins. The European varieties did not show any signs of starting. On March 15th the pistillates of the "English" walnut made their first appearance, but all the male flowers, or staminate catkins, had dropped off. On March 22d the European varieties began to put forth. As a consequence there was no crop of "English" walnuts, but the European varieties set well.

priced in its home in France, a common and cheaper grade is often mixed with it, to the disgust of nut importers in New York and Chicago. The Mayette was originated by a man of the name of Mayet, one hundred and thirty years ago, having ever since been a great favorite as a market nut.

"My trees did not produce until the sixth year. They are a large, excellent nut."—West.

"One of the finest dessert nuts grown; large, full-fleshed, and sweet. Very late in budding, thereby escaping injury from late frosts."—Rock.

**Mesange*.—This nut has a very thin shell, and derives its name of Mesange from a little lark of that name that goes to the kernel through the tender and thin shell; very productive. This may be regarded as a first-class family nut, but I would not recommend it as a market nut, on account of its rather small size and thinness of shell.

**Vourey*.—This new and valuable variety of recent introduction originated near Vourey, France, hence its name. The nut has the shape of the Mayette, but is more round and smaller; the shell is thin, light colored, and smooth, and the kernel exceedingly sweet and nutty; very hardy.

"The nuts are very large and the shell well filled with a sweet, rich kernel. The leaves and flowers are produced late."—Rock.

Grenoble (Plate XXII, Fig. 5).

**Meylan*.—A new and very attractive variety, originated near the little village of Meylan, in the walnut district of France. The nut is of fair size; the smoothest one of our collection, very thin shell, and of excellent quality; buds out late.

**Serotina* (*St. John*) (Plate XXII, Fig. 3).—I find this variety not to be so late in budding out as to not be sometimes injured by late frosts in the spring. The nut is of medium size, well shaped, with a very sweet, nutty meat; enormously productive.

"This variety came into bearing the fifth year from planting. It is of less value than others grown by me. Its flavor is not quite so delicate, and the shell a trifle harder, but as it is a week later in showing leaf in the spring, it will suit frosty localities."—West.

"Leaves and flowers of this variety are not developed until all danger of frost has passed; very productive."—Rock.

Mobart (Plate XXII, Fig. 2).

**Vilmorin*, or *Cross-Bred*.—This curious variety was obtained by "hybridizing" years ago, in France. It is a cross between the English walnut and the Eastern Black walnut, and was called Vilmorin after the leading member of the well-known seed firm of Vilmorin, Andrieux & Co., of Paris. The nut is small, and has the shape of the English walnut, but the furrows of the Black walnut; it is darker than the English and lighter than the Black. It can hardly be called an improvement on the Black walnut; surely it is not on the English. It is a very odd sort, having no commercial value whatever. We have fruited this cross-bred walnut for the last seven years, and find that either as a family or market nut this cross-bred variety is entirely worthless. It must be regarded and propagated, therefore, simply as an ornamental variety.

**Weeping Walnut*.—A new and very curious kind of walnut, highly ornamental, the branches drooping down like those of the weeping-wil-

* Described by Mr. Felix Gillet.

low. We have had limbs on some of our weeping walnuts growing to eight feet through the summer, drooping straight down, with the ends dragging on the ground, and even trailing on it to a length of twelve to twenty inches. The nut is of fair size, oblong, thin-shelled, and of good quality. It looks to be a very abundant bearer.

Rivera Hard-Shell (Plate XXII, Fig. 7).

Rivera Soft-Shell (Plate XXI, Fig. 8).

**Laciniated, or Ash-Leaved.*—The foliage of this kind of walnut is so delicate, so finely cut up, that it makes of it a most graceful ornamental tree, worthy to be planted conspicuously in the garden or front yard. The nut, besides, is exceedingly pretty, of fair size, round, with a very smooth shell and sweet kernel. The tree is claimed to be an abundant bearer.

**Parisienne.*—Large, excellent, starts late in spring. This beautiful nut, also one of the finest for dessert and market, was originated in the southeast of France, and not in the neighborhood of Paris, as its name would imply; its beauty made it called *Parisienne*, in honor of the capital of France. The nut is large, broader at the small end than the Mayette and Franquette, and has a very pretty shape. It is as late as the Mayette, and as desirable for market.

"A most beautiful nut; one of the largest and best for dessert, broad and large, with full-fleshed kernel. Bears early and regular."—Rock.

**Alpine, or Wonder of the Alps.*—A new and very rare variety originated not long ago in the Alps Mountains, in France. Next to the Mammoth it is the largest walnut grown on my place. Though the shell looks a kind of rough, it is perfectly soft and thin, and the meat sweet and filling well the shell.

**Lanfray.*—A newly originated variety. Very pretty nut, oval in shape, of fair size and first quality.

**Poorman.*—A new kind, of recent introduction.

Fertile (Plate XXII, Fig. 1).

**Præparturiens or Fertile, First Generation.*—This variety was introduced into the State by me, in the winter of 1870-71, and in my grounds, 2,600 feet up in the Sierra, are the first trees of that kind that ever produced fruit in this State. Described as follows: The *Præparturiens* was originated in France, in 1828; from the fact that it first bore nuts while being but two years old, the Latin name of *Præparturiens* was given to it from *Parturiens*, bearing, *Præ*, before—bearing before the usual time. It was also called *Fertile*, on account of its surprising fertility. The nut is small, though thin-shelled, and very sweet; it is this nut that produces "Second Generation" trees.

**Præparturiens or Fertile, Second Generation.*—The Second Generation *Præparturiens*, the kind we recommend to plant, has retained all the characteristics of the original, only the nuts are much larger, and larger, too, than those of the third and fourth generations, seventy-five per cent of the trees bearing nuts from medium to large, and twenty-five per cent from small to medium, and of all sorts of shapes—all, however, being thin-shelled and of first quality. The *Præparturiens* is one of the most productive kinds, and bears heavy crops from the start, and it may be regarded as the best variety of walnut to plant for family use; the largest *Præparturiens* nuts, though, being well marketable.

*Described by Mr. Felix Gillet.

**Third Generation Præparturiens.*—The kind mostly sold in California under the generic name of *Præparturiens*, and grown from nuts borne on Second Generation trees. The nut is generally small—too small for market, but of first quality.

**Mammoth Præparturiens.*—A large-fruited variety of *Præparturiens*, originated in France. The nut is extraordinarily large; soft shell, and with a full-fleshed kernel.

Præparturiens (Plate XXII, Fig. 8).—“This variety has proved exceedingly satisfactory. It will bear in nursery rows when not more than four feet high, and continue to have a crop every year, and has never been injured by spring frosts. On my place are seedlings of the second and third generations, which still convey their fertile and early-bearing qualities. The nuts on mature trees are of good size and of the best quality.”—West.

Gant (Syn. *Bijou*) (Plate XXII, Fig. 4).—“Nuts very large, twice or three times larger than the common walnut, and sometimes square or oblong in shape.”—Rock.

“The *Bijou* is the largest walnut known. This variety began to bear when it had been planted four years, and has constantly increased its yield. In 1890 it bore a large crop, and in 1891 it set its fruit so quickly that I thought best to remove at least one third of it. The reputation of this tree in its home—France—is that of a shy bearer. The quality is excellent, superior to anything I have seen.”—West.

**Mammoth, or Jauge.*—This is an immense nut, the largest yet originated. So large is the shell of some of them that “ladies’ companions” are made out of the shells by fancy-goods manufacturers wherein to stow away gloves and handkerchiefs. The nut, though of such large dimensions, has a thin shell, and the kernel is of first quality.

**Cluster (Juglans Racemosa)* (Plate XXI, Fig. 7).—This remarkable kind of walnut, introduced some twenty years ago into this country, is a worthy rival of the *Præparturiens* for productiveness, but superior for the beauty of the nuts. It derives its name of *Juglans racemosa* from the Latin word *racemosus*, meaning abundant in clusters, full of clusters, which is the main characteristic of that most beautiful variety. The nuts, when the tree is in full bearing, grow in long clusters of 10, 15, and even 25 to 28 nuts. The *Cluster*, like the *Præparturiens*, reproduces itself well enough from the seed, *provided* that the nuts be gathered from trees *grafted from the original*. The nut is thin-shelled, of fair size, hermetically closed, with a smooth, white shell; in fact, a perfect beauty.

**Barthere.*—“A singularly shaped nut, elongated, broad at the center, and tapering at both ends; the shell is harder than that of other sorts.”

Kaghazi.—Of doubtful origin; grown about Niles, in Alameda County.

Grand Noblesse.—Described, in “Nut Culture in the United States,” as having originated by L. L. Bequette, of Los Nietos, but is very little known by the growers of that section.

VARIETIES OF HOME ORIGIN.

The chapter on pollination of the walnut illustrates how varieties originate by accident, or from chance seedlings. The following varieties originated in that way; they have been fully tried and their merits have become known, and are therefore entitled to be placed among the list of varieties worthy of cultivation:

*Described by Mr. Felix Gillet.

**California Paper-Shell* (Plate XXI, Fig. 1).—Originated by Mr. Felix Gillet. A nut borne on a grafted Chaberte, the tree being, therefore, a Second Generation Chaberte. The nut is only of medium size; shell very thin and almost white; kernel full-fleshed, exceedingly sweet and nutty.

**Columbus*.—Originated by Mr. Gillet. Produced from a Second Generation Mayette. The nut is very large, exceedingly pretty, roundish, with smooth, light-colored shell, and kernel of first quality. Named Columbus in honor of the World's Fair in 1893, the year that my second trees of that kind went into bearing.

**Mayette-Shaped Præparturiens*.—Originated by Mr. Gillet, some twenty-five years ago. A large nut, sitting on its end like the Mayette, hence its name. Full-fleshed kernel of first quality; heavy bearer. Solely propagated by grafting.

**Cluster Præparturiens*.—A variety of Præparturiens said to be very fine, also originated by Mr. Gillet. Nut large, oblong, smooth surface, perfect soft-shell; kernel fine and sweet. Growing in clusters.

Soft-Shell.—Originated from seed, by Mr. Joseph Sexton, of Goleta, Santa Barbara County, in 1868. The seed he procured in San Francisco, which was labeled "English," and was supposed to have been imported from Central America. Mr. Sexton describes this variety thus: "Nut looks very much like the imported Chile walnut, having the shape and color. The objection to this variety is that as the trees grow older the nuts grow smaller—diminish in size—and are not as salable as larger nuts."

Improved Soft-Shell (Santa Barbara Soft-Shell) (Plate XXI, Fig. 10).—Originated by Mr. Joseph Sexton, of Goleta, Santa Barbara County, in 1870, from seed of the "Soft-shell," crossed with the hard-shell or "English" walnut. The nut in outer appearance resembles the "English" or hard-shell, but the shell is as thin as the "Soft-shell," and the kernel or "meat" is a beautiful white color. Tree productive, uniform, and symmetrical in growth.

Ford's Improved Soft-Shell (Plate XXI, Fig. 6).—Originated in 1877 by Mr. George W. Ford, of Santa Ana, from seed he obtained in San Francisco, and supposed to have come from Mr. Joseph Sexton, of Santa Barbara. Out of the twenty-five pounds of walnuts he obtained, one hundred of the largest and finest nuts were picked out, and from these twenty large nuts selected. These were planted, and from which originated this "new" improved nut. The nut resembles the "Soft-shell." It is a large, clear nut, separates easily; the meat is very white, and the tree is a handsome grower.

Ford's Eureka (Plate XXII, Fig. 6).—Originated by Mr. George W. Ford, of Santa Ana, from soft-shell nuts procured from Mr. Joseph Sexton, of Goleta. The nut is almost round, meat white, and very fine. Tree vigorous, and a fine grower.

ORIENTAL VARIETIES.

Among the most beautiful trees are the Japanese walnuts. Two varieties are known in this State, one (*J. Sieboldiana*) being grown for more than twenty years. While it has been grown successfully, its

*Described by Mr. Felix Gillet

economic importance has not as yet been determined. The nuts differ greatly from the varieties of *J. regia*, and present curious forms; they are, nevertheless, valuable, for the kernel is oily and sweet. The tree is very handsome, requires no pruning, is a strong grower, and very symmetrical in form, which, with its large, glossy leaves, of extraordinary size, render it most beautiful and especially suited for roadways and avenues. The tree is also valuable for stocks, as they "take" easily and are always healthy and of thrifty growth.

Japanese (Juglans Sieboldiana, Maxim) (Plate XXI, Fig. 4).—This variety has been cultivated very successfully in this State for more than twenty years. It is a beautiful ornamental tree, indigenous to Japan. The leaves are of enormous size. The nut is small and elongated, quite hard, but with a sweet kernel; of very little commercial importance.

Heart-Shaped (Juglans Cordiformis, Maxim).—This variety is also indigenous to Japan, and of recent introduction. The tree is similar in appearance to *J. Sieboldiana*. The nut is small and "heart-shaped," with a sweet kernel, said to be easily extracted by boiling for five minutes and then cracking.

Chinese (Juglans Mandshurica, Maxim).—This nut is also of recent introduction, and is indigenous to eastern Asia. Resembles closely the Eastern butternut in habit of growth and foliage, and is said to resemble it in the form and appearance of the nut.

(7) PLANTING, SOIL, AND OTHER REQUIREMENTS.

There is considerable difference of opinion among growers as to the proper age to plant walnut trees in orchard. Many contend that trees of three years' growth are best, while others contend that the seed should be planted where the tree is intended to grow, that it should never be transplanted, as in doing so certain roots, and especially the tap-root, have to be cut, which is detrimental to the growth and fruiting qualities of the tree. Others hold this practice to be a fallacy, and contend that the tree should be grown in the nursery until the sixth or eighth year, as is practiced in some countries.

"I commenced transplanting trees in my nursery at one year old; each year I renewed my nursery rows, planting each year so as to enable me to have trees for my own land, which I was obliged to clear in order to prepare it for the orchard. I planted after the first year, and after the second year, and continued planting year by year, from these different nurseries of different ages. When I arrived at the ninth year of planting, my trees had then been in bearing one year in the nursery. The trees that I planted out one year will bear fruit the seventh year. Eight years is as soon as I ever had them bear in my orchard from the seed. My experiments proved that the first or second year is an unnatural time to transplant the walnut. Why? There are two periods that the walnut ought not to be transplanted, that is, the second and after the fifth year; the root starts the second year and makes a partial growth, and then it divides itself between top and root. The walnut will start and grow in root the first year without starting at the top, until it has made a certain period of growth, and then the root grows if not forced. I can force a walnut and make it grow ten feet the second year, but I say that is an unnatural growth and it ought not to be indulged in. The second year I say, then, is dangerous; it is the period between the top and the root, and when you take it up you destroy that growth. The third year it makes top alone, comparatively no root; it is then that your little tree, twelve inches high, grows up to the height of six to twelve feet. It is the top that it is making that year, and of course you do not desire to transplant a tree that is all to top and not to root, because when you take it from the nursery rows you must allow that tree to go down and make the root first, before it can make the top. After the third year you can transplant it with safety. Why? It has made

*Hon. Russell Heath, of Carpinteria. (Remarks apply to varieties of the "English" walnut, hard and medium shell nuts.)

its top. The fourth year its tendency is to root and not to top, because the fourth year it makes its spurs two inches on the side of that growth of the third year. The tendency of that year is all root, and if you want to transplant a young tree, then take up your three-year-old tree and transplant it and you will get your fruit then as quickly as the age of the tree will allow it to bear. After the fifth year, their tendency is not to make root; then is the time when those little branches two inches long send out the long arms to the distance of seven or eight feet; then it is that your tender shoots, especially in exposed conditions, are liable to be cut upon the end by the frost; then it is, if you are in the interior, that one hot blast will kill the ends of your trees, because it will have vigorous growth growing after the fifth year, and about the sixth, and the only remedy is the knife, because then the tree is touched by either cold or heat.

"Transplanting walnut trees, my experience is that I never had a nut from my trees that I transplanted from one year old to seven, without waiting six years. The best success I have had, and which plan I have followed, has been when I have transplanted trees in orchard form after they had passed the age of bearing in my nursery rows. I transplanted eight hundred eleven-year-old trees and did not lose one in transplanting. It does not cost much to cultivate trees for such a period in the nursery—a thousand can be cultivated in a day—and if they were in orchard the expense would be very great; and while the cost of transplanting trees at this age is probably ten times more than for three-year-old trees, you save more than ten times that amount in the cost and care through those years while in orchard."

* "I have raised trees from the seed and transplanted all the way from a year old up to six; and while they have grown and done well, I prefer to move them at three years of age, or about that time. The best trees that I have were transplanted at three years old."

† "I want one-year-old walnut trees one to three feet, two-year-olds four to six feet, and three-year-olds seven to nine feet, all of the above to be good stocky trees. The root of a three-year-old walnut is but a little longer than a one-year-old, though it is certainly larger. Of course, the root will grow in proportion to the top of the tree, for when a walnut commences to branch—which is about four years from the seed—then the root will commence to throw out laterals."

‡ "The usual custom is to set out two-year-old trees. In setting out young trees they should be inclined toward the coast or prevailing winds, and in trimming always try to keep them in that position. By using these precautions, and insisting on having the tap-root left at least three feet long when the trees are dug in the nursery, you will be likely to have your orchard in good shape when it is grown."

§ "The best aged tree to plant is two years old; not that I think the age makes any difference, but the trees at that age are of a size that they can be seen, and run no risk of getting damaged while being cultivated. In careful hands, I believe one-year-old trees as good or better, and perhaps it would be better still to plant the seed where you want the orchard trees to grow, but if planted in this way great care must be taken for two years in cultivating, that they do not get trodden down and the tops broken off, which makes the orchard uneven and unsightly. When planting two-year-old or larger trees, they should be selected, planting the largest trees first, and keep on doing so until the orchard is finished. By so doing you can get trees of equal size together. Some say it will not do to plant the seed where you want the tree to grow, that it must be transplanted, and the tap-root cut to make it fruit. I have tested this claim and found it a fallacy, and find that nuts planted alongside of one-year-old trees have produced prolific crops, and are larger trees than those one year older."

¶ "The plan of propagation is to plant the nut in nursery form in the spring of the year, in well-cultivated, sandy loam, about six inches deep. The first year they will grow from six inches to one foot high; the second, from one and a half to three feet; the third, from five to six feet. At this period it is considered the best for transplanting to permanent sites."

The walnut does best on a moist, warm, sandy loam, well under-drained. It is a very vigorous grower, and requires ample root room, vertically and horizontally, and unless this is furnished the tree will not do well. Soil, therefore, which has a hardpan near the surface, heavy clays, or soils which hold too much moisture, are to be avoided. A fairly light, friable loam, of good depth and easily worked, offers perfect conditions in the matter of soil for the walnut.

* O. N. Cadwell, of Carpinteria. (Also refers to varieties of the "English" walnut, or hard-shell nut.)

† George W. Ford, of Santa Ana. (Remarks apply to improved varieties on the "English" walnut, or soft-shell nuts.)

‡ A. Dorman, of Rivera, with reference to hard, medium, and soft-shell nuts.

§ Joseph Sexton, of Goleta, with reference to improved varieties of the "English" walnut, or soft-shell nuts.

¶ Hon. Ellwood Cooper, of Santa Barbara, with reference to varieties of the "English" walnut, or hard and medium-shell nuts.

At a recent convention of walnut-growers, the consensus of opinion as to the best soil for the walnut was in favor of a rich, deep, sandy loam, affording good drainage, and from 16 to 18 feet to surface water. This, however, met with opposition from some growers, who claimed to have attained equally good results with walnuts growing in soils principally adobe and with copious irrigation. It was also claimed that a rich alluvial soil, with a slight mixture of adobe, with water about from 15 to 20 feet from the surface, was one of the best and strongest soils for the walnut. Mr. Ford, of Santa Ana, has some twenty-year-old walnut trees very thrifty and bearing heavy crops every year, in land where the surface water is only 3 feet below; but time can only determine how long they will thrive under such conditions.

*"The walnut should be planted for profit and best results on deep, rich loam, with no hardpan, stiff clay, or impenetrable soil nearer than 12 feet. I would select locations naturally moist in preference to land requiring irrigation. A temperature of 60° to 80° in summer, I regard as more favorable than other localities, although they thrive and are profitable in much hotter places."

†"In this part of the State (San Joaquin County), the walnut requires a deep, rich soil, one in which the roots will strike deep, so that there can be no pinch in the hot summer months."

Mr. West has grown the "English" walnut and various French varieties for over twenty years. No irrigation is practiced by him, and unless the walnut finds the conditions mentioned, it is subject to a sudden check of the flow of sap during the summer, which has frequently occurred. The leaves fall and the nuts are left exposed to the hot rays of the sun, and invariably sunburn.

‡"In planting trees in orchard, first of all plow the ground deep and then go over it with a harrow or pulverizer. Forty feet apart, giving twenty-seven trees to the acre, is the best distance to plant the Improved Soft-Shell walnut. Dig large and deep holes; plant 2 or 3 inches deeper than the trees grew in the nursery; lean them to the prevailing summer winds, and you will not have to stake your trees to make them grow straight. Press the soil firmly around the roots, and if not very moist, give each tree about ten gallons of water, which is sufficient to settle the soil around the roots. Cultivate your orchard to the depth of 5 or 6 inches. If your soil is moist enough to keep the trees in good growing condition during the summer months, irrigation is unnecessary, but to make a first-class walnut, in size and fullness of kernel, if the ground is not naturally moist enough, irrigation will have to be adopted. Small grain should not be planted in a walnut or any other orchard. If corn is grown, leave 8 feet on each side of your trees clear, though I am of the opinion that potatoes, peanuts, or beans are less injurious to the trees."

§"The usual custom has been, until the last few years, to set two-year-old trees 40 feet apart each way, and plant corn among them as long as it would make a paying crop; experience, however, has demonstrated the fact that it is better to set the trees 50 feet apart each way and reduce the number of rows of corn planted between them each year until it is finally omitted altogether, giving the trees full possession of the soil. This mode of culture usually includes irrigation as long as corn is planted. I think that if the corn and irrigation were left out after the first five years, and the land given clean and thorough cultivation, it would be more profitable for the owners. Shallow cultivation is advocated by the most successful walnut-growers in the valley after the trees have arrived at a bearing age. The old orchards are nearly all planted too close together, and it is reasonable to expect that they will fail to produce good crops sooner than they would if they had been given more room. An examination of any old orchard will show that the outside rows are larger and bear better crops of nuts than the inside ones. Trees twenty years old often have a spread of branches 50 feet across, and I think it safe to say that the roots extend twice as far as the limbs. I have broken roots as large as a pipestem in plowing 25 feet from a tree that has been set seven years. In setting out young trees they should be inclined toward the coast or prevailing winds, and with a little care they can be kept in that position. By using these precautions and insisting on having the tap-root left at least 3 feet long when the trees are

* Hon. Russell Heath, of Carpinteria.

† George B. West, of Stockton.

‡ George W. Ford, of Santa Ana.

§ A. Dorman, of Rivera.

dug in the nursery, you will be likely to have your orchard in good shape when it is grown. No limbs should be allowed to grow within at least 6 feet of the ground, as they would interfere with the cultivation of the orchard."

* "The orchard should be thoroughly plowed with a turning plow, early in the spring as soon as the ground is sufficiently dry to work pleasantly. Care should be taken not to plow so deep as to cut the roots, and as the trees are approached the furrows should be shallowed. In some cases fall plowing is practiced, turning the soil from the middle toward the rows and leaving a dead furrow in the middle. In the spring the operation is renewed and the ground left smooth for the summer. This is a good practice on dry land, as it enables the soil to retain a larger part of the winter rainfall. After the spring plowing the land should be thoroughly harrowed and left. Where irrigation is practiced the orchard should be cultivated after each application of water, usually from five to seven times in the season. Where irrigation is not followed the cultivator and weed-cutter should be used as often as necessary, in order to keep down the weeds that would rob the trees of their necessary moisture and plant elements. The great object of cultivation is to keep the surface soil in a loose condition and prevent the evaporation of the moisture required by the trees for their growth. Of course, where inter-tree crops are grown in the orchard, these rules will have to be modified to suit the crops."

† "That the walnut will grow more luxuriantly and bear larger crops at comparatively earlier age in deep and rich bottom land, well drained, well protected, and with plenty of moisture, is an obvious fact; though there arises another question: whether it is advisable to plant walnuts—a class of trees requiring so much space and with so little regard to the nature of the soil—in our richest land so well adapted to the growing of other valuable crops that have *absolutely* to be raised in *rich land*? My experience in walnut culture, and for twenty years I have imported, propagated, and fruited the leading varieties of Europe, besides having collected a large amount of data on that subject from nut-growing countries, warrants me to say that walnut culture can be successfully carried on on the whole Pacific Coast, provided we plant none but *hardy* kinds; in fact, the success of walnut culture in California lies exclusively in the hardness of the kinds to be planted."

WALNUTS IN OAK LAND.

There has been considerable doubt entertained by growers as to the outcome of walnut orchards planted on oak land. It has been contended that walnut orchards so planted will never be a success; that the roots of the oak remaining in the soil generate poisonous gases, which eventually kill the roots of the walnut with which they come in contact. Various orchards in the vicinity of Santa Barbara are cited as examples.

‡ "The walnut requires well-drained, deep, sandy bottom land, well protected, and where no 'live oak' trees have grown within the last century. Everywhere where the live oak has been recently rooted out, the walnut tree will die about the time it bears the second crop, perhaps earlier. The second planted to replace will die in about the fifth year; the third, in the first, second, or third year. I doubt if any walnut trees will do well where an oak forest has recently existed. The elder Pliny, in his work on Natural History, written nearly two thousand years ago, speaks of this fact existing on the northern coast of the Mediterranean, and cautions planters from attempting fruit-growing where an oak forest has recently existed. There are other causes, no doubt, that will prevent success. Trees will die apparently without cause, and the planter, after waiting ten or a dozen years, will be compelled to root them out and try something else. One half of the orchards that have been planted will never be a success."

§ "I have noticed in the vicinity of Santa Barbara quite a number of 'English' walnuts and other fruit trees being planted on land recently covered by live oak. These orchards can only result in failures, which the owners can ill afford. The precautions laid down in my essay before the Sacramento Convention in 1886 should not be disregarded until it is practically demonstrated that they are without foundation."

¶ "With regard to planting the 'English' walnut on oak land, it is a question that I approach with a great deal of delicacy, especially as I am led to differ from our President (Mr. Cooper), a gentleman whom I esteem as high as any man in the State, as to the poisoning of walnuts. My place of two hundred acres was one mass of oaks, and there is not one single acre of the one hundred and eighty acres now in walnuts but what had

* Wm. Moss, of Rivera.

† Mr. Felix Gillet, of Nevada City.

‡ Hon. Ellwood Cooper, essay before State Fruit-Growers' Convention, Sacramento, 1886.

§ Hon. Ellwood Cooper, address before State Fruit-Growers' Convention, Santa Barbara, 1888.

¶ Hon. Russell Heath, address before State Fruit-Growers' Convention, Santa Barbara, 1888.

oaks that would cut from four to fifteen cords of stovewood, and yet I never lost a tree planted among the oaks. Now, whether the oak is poisonous in the soil occupied by Mr. Cooper's orchard and not in Carpinteria, is a question that only the analysis of the soil can prove; but in my locality the oak is not poisonous to the young walnut. The great mistake, in my opinion, in the raising of the walnut, is that a suitable locality is not obtained.

"Since the above was submitted, I have made thorough examinations of the effects, if any, of the oak on the walnut, and remain of the opinion that the oak does not contain any substance poisonous or detrimental to the walnut. If dead timber is allowed to remain on land, in the decayed trunks may often be found a large worm that feeds on the decayed wood. In my examinations I have never found an instance where these grubs interfere with the living wood of the walnut or any other tree. That many walnuts planted within the last five years have failed to become profitable, and in many instances have died, I think is very easily to be explained."

"The most suitable land for the walnut is the sandy loam; a light, deep, rich soil, with water not nearer the surface than 12 or 15 feet. Many of the planters have disregarded this requirement, and from this cause can be attributed a great proportion of the loss of trees.

"In the Carpinteria Valley the water has been gradually rising. In my orchard in front of my house, where the water was about 18 feet deep when I planted that part of my orchard, it is now less than 6 feet, and I have lost about twenty acres of twenty-five-year-old trees, by the rotting of the roots. I caution all planters to be careful about the depth of water from the surface. In one part of my orchard I had about twenty acres of soft-shell walnuts all in bearing; these trees have died to such an extent that I do not now replace with that variety. I can find no cause for the dying of these trees, and have concluded, with many others in the same fix, that the soft-shell walnut is a short-lived tree."

The writer, in 1886, visited Mr. Cooper's extensive orchards at Ellwood, near Santa Barbara, and he very kindly showed me the walnut orchards where trees had died, and which land was formerly occupied by live oaks. The then existing conditions fully corroborated Mr. Cooper's views, and my observations pointed strongly to two causes: first, oak roots remaining in the soil, which generated poisonous gases that have a deadly effect on other roots; secondly, shallow soil and imperfect drainage, through which causes scores of trees have died all over the State. That poisonous gases are generated by roots of forest trees remaining in the soil, has been fully proven in other parts of the State. As an example, I will cite the orchard of Dr. Edwin Kimball, at Haywards. The land formerly contained many huge sycamore trees; these were dug up and the land planted to prunes, peaches, and apricots. When the apricots attained the bearing age and were in full fruit, they suddenly died down. The exact spot where a sycamore stood is shown by a vacant circle, upon which no tree of original planting stands. Nearly ten years after large roots were unearthed, which still showed life, and upon being exposed emitted a strong, disagreeable, and unbearable odor. There are many other similar cases on record. This same sad experience was met with by other growers, who neglected to extract from the soil the greater portion of the roots, not only of oaks, but also of pines, sycamores, etc. Even willows have been the cause of much trouble. On the other hand, the greater portion of the largest orchards in the State are located where large oaks, pines, and sycamore trees once stood, but care and precision were exercised in removing the roots from the land. There are many who contend that no trees have died in their orchards from this cause, and they ascribe the death of such trees to the time of year the forest trees have been dug up. It is said that if the trees are dug up during the growing period, the roots remaining in the soil will decay in one or two seasons, acting, in this respect, similar to the tree itself when cut back while growing, being full of sap the sudden check causes death; whereas, if dug up in the dormant state, in winter, the roots act as a cutting, keep alive for many

years, and are only prevented from putting forth growth by being under ground. While the theories advanced are logical, and be the causes what they may, success can only result where precision is applied. In places where roots remaining in the ground have caused trouble, the growers have found that it is best to let the oaks stand, and plant trees, around them. They are headed back to prevent too much shade, but as they continue growing the roots do not interfere with the growth of the orchard trees.

SOIL EXHAUSTION THROUGH THE CULTURE OF THE WALNUT, AND FERTILIZERS TO USE, ETC.

By PROF. S. M. WOODBRIDGE, Ph.D., Agricultural Chemist, Los Angeles. Prepared by special request.

The walnut crop is involved in more or less mystery, and is little understood in the abstract, or from a chemical standpoint, although from a practical standpoint the matter of maintaining the original integrity of the soil, and in fact the building up of a poor soil, is well understood and readily accomplished.

To give an illustration, let us look at the orange. In an orchard in the San Gabriel Valley the soil analyzed 1.14% in potash. Taking the soil to a depth of only 2 feet, an acre of ground would contain about 100,000 pounds of potash; this potash would be enough to supply an annual crop of 20,000 pounds of oranges for more than 2,000 years; the figures from which the above conclusion is drawn are taken from the report of the State Analyst. Before the orchard was fifteen years old, it showed marked signs of degeneration. The practical application of potash in conjunction with nitrates and phosphates, some five years ago, revived the orchard, and the annual application of a complete fertilizer has since kept it in a most flourishing condition.

Again, it is a well-known fact that in new ground, suited to the purpose, from 400 to 500 bushels of potatoes can be raised the first year; the second year scarcely one half that amount can be raised, and the third year the field would hardly give its seed back; and yet the soil of such a field would analyze practically the same at the end of the period as it did at the beginning. Nevertheless, the soil is exhausted from the practical standpoint of the farmer, that is, he cannot raise a paying crop of potatoes; and yet from the standpoint of the chemist the soil is as rich in plant-foods as ever—the little that would have been withdrawn by three such crops, as are above described, being only the ten thousandth part of the plant-food in the soil.

What is true in regard to the exhaustion of the soil by an orange or potato crop is also found to be true in practice in regard to the walnut.

Chemical science has settled the fact that *nitrogen*, *phosphoric acid*, and *potash* are the only three expensive elements that any soil is likely to become deficient in; therefore, as a general rule, those are the only elements that must be added in order to do everything that is known to science in order to properly feed any crop. In order, however, to make these elements, when applied, most effective, the soil must contain a sufficient amount of humus (decomposing vegetable or animal matter).

It is a well-known fact that the best results are attained in horticulture where circumstances admit of a rotation of crops; the same crop not being reached oftener than once in four or five years. In an orchard



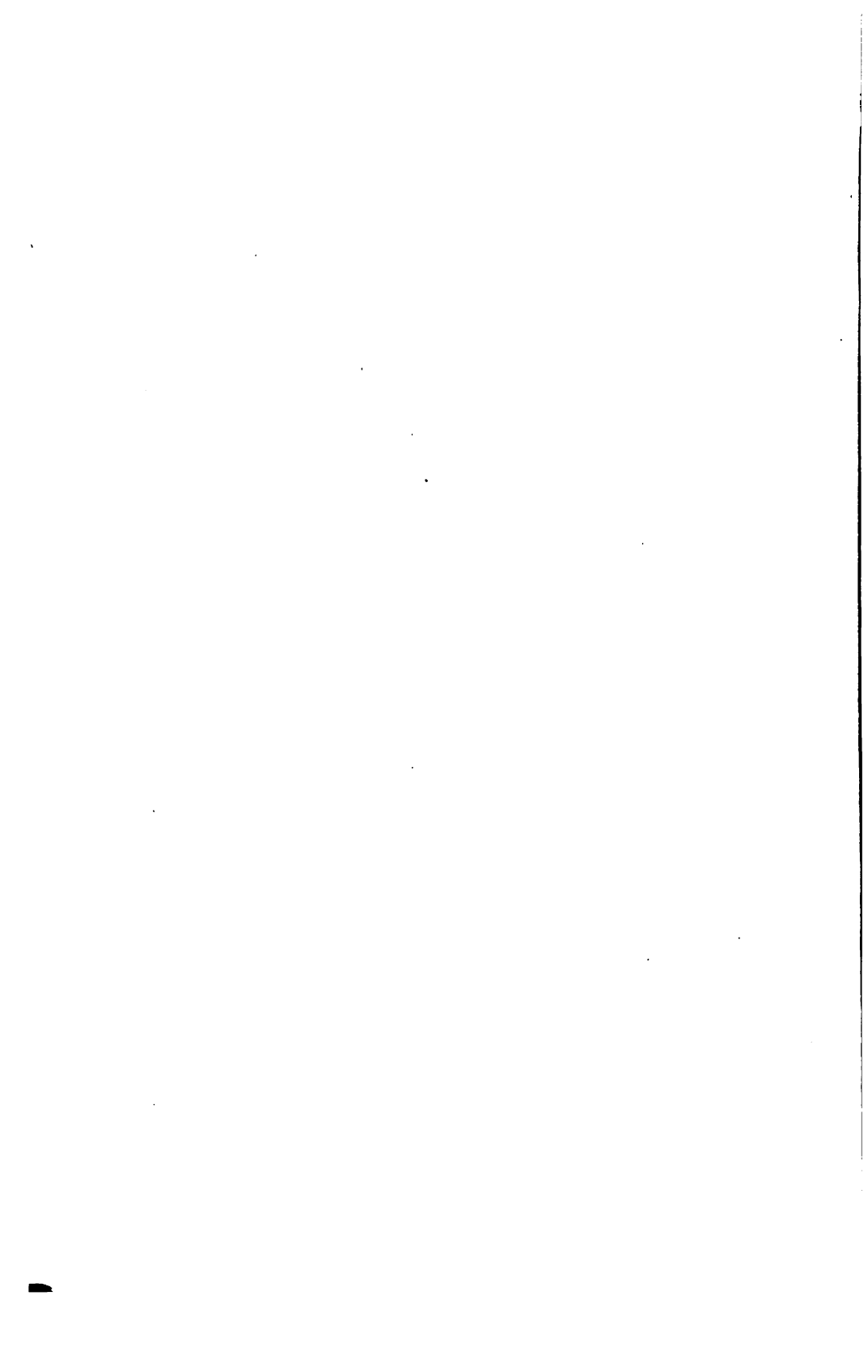
1.

2.

ROOT-GRAFTING THE WALNUT.

1. Root, with scion inserted, ready for waxing.

2. Root grafted, tied, and waxed over, ready for planting.



it is impossible to rotate a crop, as the trees are set for a lifetime; but the next best thing to a rotation is in keeping up a rotation of green crops for plowing-under, and in this way keep supplying the humus and nitrogen at a nominal cost. These crops, of course, are planted during the fall, and are grown at a time when the tree is dormant.

In order, then, to get the best results from a walnut orchard two things are necessary: (1) Prevent the soil from becoming exhausted; and (2), keep a due amount of humus in the soil.

The first proposition can be done by applying annually these elements in the proportion in which the crop, the wood, and leaf growth may remove them. It would be both amusing and interesting for a rich chemist with little to do and who might own a walnut orchard to ascertain these facts by a collection of all the leaves, new growth, and crop over a series of years, and his report might be most interesting to the few chemists who would read the same, but the farmer could scarcely keep awake over it. What the farmer desires to know is which and how much of the essential elements need to be added, and the cost of such application. To this question the answer can be given by the crop and trees themselves, although the experiments have not been carried over a series of years; but for two succeeding years excellent results have been attained by using to every 4 pounds of nitrogen, 9 pounds of phosphoric acid and 5 pounds of potash in the form of muriate. The phosphoric acid should be in the form of a super-phosphate, that is, treated with sulfuric (sulphuric acid), which renders the phosphate readily soluble in water so that it may be immediately available.

A ton of fertilizer containing the fertilizing elements in the above proportions of 4% nitrogen, 9% phosphoric acid, and 5% potash, should not be worth to exceed \$35, freight paid.

Now, as to the amounts to be applied: 5 pounds to a tree three years old appears to be the limit from which any good can be derived; 12 pounds per tree to an eight-year-old orchard produces good results, some of the trees yielding 100 pounds and all the trees averaging over 75 pounds of nuts; on eighteen-year-old trees 25 pounds (per tree) was applied with satisfactory results. Taking the case of the eight-year-old trees, the cost of fertilizing an orchard, where the trees were twenty-eight to the acre, would be \$5 60, or about 3 $\frac{1}{4}$ % of the value of the crop.

(8) PROPAGATION.

The raising of walnut seedlings is very simple, but great care and attention are required in all points bearing on the germination of the nuts. There are various methods used, but the most simple is as follows: The walnuts are placed in sand, preparatory to planting. A frame, consisting of 12-inch boards set on edge, of any size desired, and resting on the ground, is half-filled with sand; the nuts are then spread thickly (4 to 6 inches) and covered with about 3 or 4 inches of sand. The sand is kept moist, but not too wet, and in case of lack of rain, is watered. An embankment of earth is made all around the frame to prevent the nuts from drying. They are examined from time to time and as soon as the nuts indicate or show signs of sprouting they are taken up and planted in nursery rows, from 12 to 24 inches apart.

After the first and second years' growth the plants are of a suitable size to bud or graft, or are left in the nursery as seedlings until large enough to transplant into orchard form, the second or third year.

(9) BUDDING THE WALNUT.

There are several methods employed in budding the walnut, among which the following, by the writer (published in 1889*), has proved very successful: Trees are budded in July, August, and as late as September. The bud is cut (shown in Fig. 8) about $1\frac{1}{2}$ inches long. In cutting the bud from the stick the cut is made deep into the wood, the object being to give the bud as much bark as possible. The wood in the bud is then partly removed; it is gouged out with the sharp point



Fig. 8. The bud, front view.



Fig. 9. The bud, transverse section.



Fig. 10. The bud, side view.

of the budding-knife. This is done to allow the inner bark of the bud to unite with the inner bark of the stock, which union would be prevented if the wood in the bud should be allowed to remain. After the wood has been partly removed (as shown in Fig. 9), the bud is inserted into the slit made in the stock, the same as is done in the ordinary method of budding practiced on fruit trees. The bud is then tied tight, with heavy budding twine of at least 18-ply. Three weeks or so afterward, if the bud has "taken," the twine is untied and tied over again; this is done in order to prevent the twine from cutting into the bark. This, however, is not required to be done if the trees are relaxing in growth, or are of such age as to have a bark thick enough to stand the pressure without injury. On young and thrifty growing trees it is best to loosen the twine at the third week, and it should be removed altogether at the fifth or sixth week. The buds are then allowed to lie dormant until spring, when the stocks are cut back to force the bud to start in the month of March or April, according to locality. As the

* Annual Report of State Board of Horticulture, 1889, p. 137.

walnut does not put forth until late in the spring, walnut stocks should not be cut back until they show indications of a rise of sap; with me this has been the most successful time. As soon as the stocks begin to put forth they are cut back and the buds allowed to grow. In cutting back the stocks great care must be exercised. They must not be cut back too close to the bud so as to endanger it, as the stocks invariably have a tendency to die back at the tip, at least an inch or more. As the buds start they are allowed to grow at will until they become hardy; they can then be trained to the remaining portion of the stock or to a stake, in order to produce a straight tree. After the first year's growth they can be transplanted to orchard form.

ANNULAR OR RING BUDDING.

This method is one of the simplest and safest to use on the walnut, and especially adapted to young trees of two or three years old, and to smooth limbs of large trees. In this method a ring is cut right around

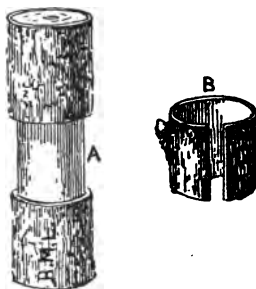


Fig. 11.

A. The stock prepared. B. The bud.

the stock, about an inch long. Then a ring of about the same size is taken from the cion, containing a bud, which is slipped into the corresponding space in the stock, and then bound tightly with soft cotton twine or cloth, covering it up to exclude the air. The operation should be performed when the trees are in full growth, during July, August, or September, and left to lie dormant through the winter, to be started in the spring.

(10) GRAFTING THE WALNUT.

Walnut-grafting is not as easily performed as budding. Great care must be exercised in the time and manner in which the operation is performed. The walnut, as a rule, cannot be grafted successfully by the ordinary methods practiced on fruit trees. The reason is that the cions contain but little wood, the pith in them being much greater than in cions of other trees; and when the cion is prepared (wedge-shaped) very little wood is left in it and the bark is so thin that, when inserted, it cannot unite with the stock, not being held firmly in position. Terminal shoots, however, have a thicker bark and more wood and are most success-

ful in grafting. Side grafting is accomplished with success, but can only be performed in the spring, when the sap in the stock begins to rise; this is necessary, as the cion must be inserted when the bark peels, in the same manner as a bud. The walnut does not put forth until quite late in spring, and to secure good, firm wood it becomes necessary to gather the cions before the trees start; and that they may be kept dormant are covered with moist sand and placed in a cellar or cool place. In this way they can be kept until the stocks have made sufficient growth so as to facilitate grafting. I have experimented in grafting the walnut for over twenty years, and the most successful method with me has been the *prong graft* or *prong bud* (of my own origin). (See Plate XX, Figs. 1 to 5, illustrating prong budding.) In this method the small prongs found at the extremity of the shoots are used. (Fig. 2, Plate XX, illustrates the prong—cion—used, and how cut from the branch, reduced one half.) The prong is cut as a *bud*, as shown in the illustration, and the wood is partially removed with the point of a budding-knife, the same as in the method of budding herein described. The stock is first prepared by cutting off with a sharp saw and smoothing over with the knife; a vertical incision is made on the side, and the cion inserted and tied tight with strong budding twine of at least 18-ply. The cuts are waxed over with grafting wax. After the cion has started the graft is examined from time to time, and if it is found that the twine begins to cut into the stock, it is untied and tied again; this will prevent any injury to the stock or cion. The twine, however, should be allowed to remain as long as possible, as it prevents the bark surrounding the slit made on the stock from opening and unseating the cion, which is apt to occur from the action of the atmosphere causing the cion to dry out and die. When the cions have grown from 6 to 12 inches and assumed the functions of the top, this precaution is no longer necessary, and the twine is then removed altogether. The growth of the cions at this time, however, is very tender, and they may be broken off by the slightest touch; as a protection it is well to drive a stake at their side, to which they are tied with some loose material or cloth strips. When this method is employed on large limbs, or on the tops of trees, it is well to tie a piece of limb or wood of any kind on the side of the branch and to which the growth of the cion should be tied. Another good protection is to take a piece of green shoot and tie both ends to the branch so grafted, forming a loop over the bud, to prevent birds, etc., from sitting on the graft and thereby disturbing it.

CLEFT ROOT GRAFTING.

One of the most satisfactory methods practiced on small walnut stocks is the cleft root graft, and its application does not differ materially from the method practiced on pear and apple roots.

The small plants (only one-year-olds are used) are taken up and grafted indoors. (See Plate XVIII, Figs. 1 and 2.) They are cut off at the crown and split obliquely and the cion (wedge-shape) inserted and immediately tied with 6-ply or 8-ply budding twine or cloth, and waxed.* They are then heeled in sand in some convenient place, exempt from

* Only wax the parts cut or exposed, so that on planting the string or cloth on the parts not waxed may decay and not bind the stock. It is also advisable to cut the twine or cloth on planting.



GRAFTING THE WALNUT.

1. The cion prepared.
2. The cion inserted in the stock, ready for waxing.
3. A cion tied and waxed over; growing; three weeks after being grafted in the spring.—From photographs; natural size.

draughts and sunlight, as follows: On the floor of a propagating house or shed moist sand is spread out from 6 to 12 inches deep; then the grafts are put into it standing, thickly, and covered with sand. The entire graft to within an inch or two of the top is covered without injury to it. The sand should always be kept moist, but not too wet, as the bark of the graft is liable to decay; and again, the sand must not be allowed to get dry, as the bark of the graft will shrivel and avoid adhesion. They are kept thus stored from four to six weeks, during which time the parts (cion and stock) callous over; they are then planted in nursery rows, and soon after begin to grow.

TRIANGULAR CROWN GRAFT.

Like the preceding method (cleft root graft) this, too, has proved successful. The stocks (a year old) are not split, but instead a triangular incision is made in the side of the stock, as shown in Fig. 12 at C, about 1 to 1½ inches long. At this point the wood of the stock is generally quite solid and the pith very small. This cut rather consists of taking out of the stock a triangular piece, into which space a cion is inserted of the same shape and size. D shows the space; A the cion prepared for insertion. The cion (from terminal shoots preferred) is prepared to fit the corresponding space, as shown at B, and fitted into the cleft. It is then tied with cloth or twine and waxed over.

This method is also employed with success in the field. The earth is removed from around the stocks and the tree is cut smoothly about the crown or where the swelling of the root begins. The graft being inserted, it is tied with cloth, and waxed. The soil is then banked up against it, covering the graft and stock to within an inch or two of the top of the cion. For making the cleft and facing the cion it is important that the knife be sharp to make a smooth cut. This operation (in the field) is best performed, and most successful, when the stocks begin to show signs of growth late in the spring. The cions are cut late in the fall, or early spring, and kept in sand preparatory to using.

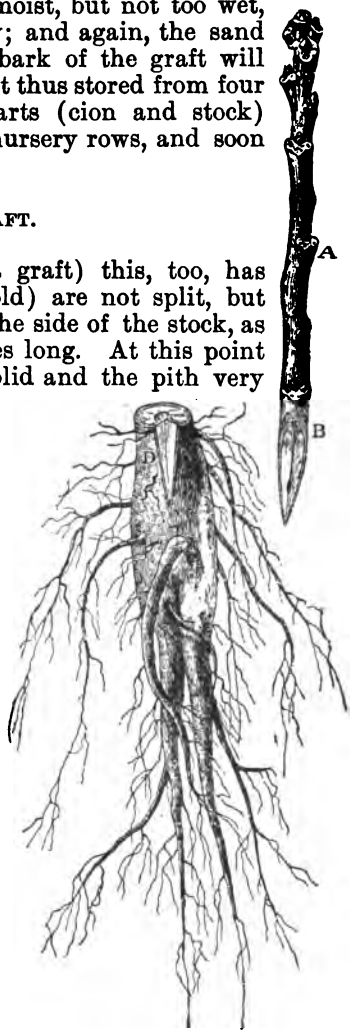


Fig. 12.

CLEFT SAP GRAFT.

Much credit is due to Mr. Felix Gillet, of Nevada City, who has experimented with all sorts of grafting on the walnut for many years, for having given the public the results attained by him in the use of this method. The operation is performed early in the spring when the sap is commencing to flow, and can be used on large limbs from 3 to 5 inches

in diameter. The limb is sawed off and smoothed as for ordinary cleft grafting; instead, however, of making a single cleft through the center, two are made, one across the stub at each side of the center, the clefts then being in sapwood instead of through the heartwood and pith. The cion is prepared as for ordinary cleft grafting, for which purpose it is best to use terminal shoots. In cutting the cion great care must be exercised to cut only into the pith of one side. The cion having been inserted, the wound is bound well with cotton cloth and thoroughly waxed.

(11) THE BLACK WALNUT (*Juglans Nigra*, Linn.).

The relative merits of the black walnut for stocks to graft onto have been under consideration for many years, and this root has been extensively tried in this State, with satisfactory results. The variety mostly used is the *Juglans Californica*, or California black walnut. (Plate XXI, Fig. 11.) In a few instances *Juglans Americana*, or Eastern black walnut (Plate XXI, Fig. 9), has been tried, but preference was given to the former, being indigenous to our State. The Japanese walnut (*Juglans Sieboldiana*) has also been tried, and has proved quite satisfactory, but is not as strong a grower as the *Californica*. For a time I was loath to believe the stock would influence the graft and cause it to produce nuts of a dark shell. Experiments, however, have proved the contrary. Trees now in bearing for over twenty years show no variation in color of shell, but an improvement in kernel and quality of the nuts. The stocks are thrifty and healthy, easy of propagation, and easily budded and grafted. Some twenty years ago I commenced experimenting in grafting and budding the wild walnut, with very satisfactory results. A plot of *Juglans rupestris*, growing along the mountains in Los Angeles County, was worked over to different varieties very satisfactorily, but the stock is quite scrubby and of such dwarf habit that it can only be recommended for dwarf purposes. The grafts took well and made splendid growth. In all tests made on trees in the wild state, nuts were produced on buds and grafts the second and third years. In some cases the nuts were quite small, due perhaps to the stunted condition of the stocks, for all must have been very old. The buds and grafts that made the strongest growth were on stocks which did not look so aged. These are now producing fine nuts, equal to those from the parent tree.

The oldest walnut orchard budded on the *Californica* is at Winters, Yolo County, and the trees are over twenty years old. This orchard has produced fine crops yearly and the nuts show a marked improvement over those produced by the parent trees.

At Vacaville two rows of large black walnut trees (*J. Californica*) were worked over to different varieties of the "English" or "Persian" walnut very successfully, by the prong bud method, described elsewhere, and the ordinary cleft sap graft. The trees were planted some thirty years ago for shade along the roadside. In the winter of 1892 the limbs were cut back to the crotch or main stem. In the spring they put forth numerous shoots, which were thinned out to a dozen or so to each tree, according to the spread of the branches. These new shoots were budded in the summer. Those that did not "take" were grafted in the winter. Thus a fine stand of buds and grafts was obtained,

which commenced to bear the second and third years. They now form large spreading heads, and bear regularly.

The process of converting these apparently worthless trees, except for shade, into fruitful trees, was very simple, and has proved remunerative and entirely satisfactory to its projector.

In Ventura County are to be seen many walnut orchards of recent planting budded and grafted on this stock. This was brought about by the satisfactory results obtained from walnut orchards so worked of early planting. In the past few years large plantings of walnuts have been made, and many growers have given preference to trees grafted and budded on this stock—*J. Californica*.

VARIETIES OF THE BLACK WALNUT.

Since the relative merits of stocks for the walnut have been discussed, it is deemed proper to append a list of varieties with which further trials can be made. The following varieties and their description (marked with *) are taken from a bulletin on "Nut Culture in the United States," issued by the Division of Pomology of the Department of Agriculture:

**Gordon*.—"Size large, form cubical, slightly conical at each end, shell of medium thickness, cracking qualities good, kernel light-colored, plump, quality excellent."—Virginia.

**Missouri*.—"Size medium, form oval, compressed, with quite smooth shell, cracking qualities good, kernel light-colored, plump, flavor pleasant, quite free from the grossness characterizing the species; quality very good."—Missouri.

**Peanut*.—"A rather small pyriform nut. The shell is thin and easily cracked, while the kernel, which is in the larger end of the nut, comes out entire. The kernel is white and of delicate flavor."—Ohio.

**Nurza*.—"A large nut with thin shell, kernel large and of good flavor. Also a strong grower."—Ohio.

**Taylor*.—"A quadrangular-pointed nut of good size. The shell is thin and easily broken with a slight blow. The kernel is large, coming out in halves; the meat is white and of fine quality."—Ohio.

**Thomas*.—"Size large, form oblate, compressed, slightly pointed at base, considerably so at apex, shell medium to thin, cracking qualities medium, the kernel not easily removed in perfect halves from the shell, flavor sweet, rich, quality good to very good."—Pennsylvania.

American ("Eastern") (Plate XXI, Fig. 9).—So called by reason of having been produced from seed imported from the East. The tree is large and handsome, and reproduces itself or "comes the same" from seed. The seed germinates easily, and the plants stand transplanting and are easily budded and grafted. It makes a beautiful shade tree along driveways and avenues. The nut is of medium size, very dark, and somewhat furrowed, and hard.

Californica (*Juglans Californica*, Watson) (Plate XXI, Fig. 11).—A rapid-growing tree, indigenous to the central and northern parts of the State. It occurs nowhere below the Sierra Madre Mountains and Coast Range in the wild state. "Comes the same" from seed, stands transplanting, and is easily budded and grafted. The nut is of medium size, shell quite hard, and smooth. The kernel is quite rich and oily. This

stock has come into great favor for budding and grafting onto. The tree attains great height, and many trees are to be seen over 100 feet high, and of great dimensions. This species has been confounded with the Dwarf or Wild Walnut (*J. rupestris*) indigenous to the southern part of the State, extending from the Tehachapi Mountains into Arizona and Mexico.

Dwarf or Wild Walnut (Juglans rupestris, Eng.).—This species is indigenous to the southern part of the State, extending from the Tehachapi Mountains to the south. It is a small, dwarfish tree, but a vigorous grower. "Comes the same" from seed, and is easily budded and grafted, also bears transplanting. The nut is quite small, very hard and smooth, but of little or no commercial value.

(12) PRUNING THE WALNUT.

* "During the first year constant pruning is necessary to have the tree properly shaped. I have pruned in a summer as many as four or five times. Branches are apt to grow too rapidly, bear down with their own weight, and break off during high winds, destroying the symmetry of the tree and occasioning much loss of time. All lateral branches growing from the leader should be cultivated to assume an upward angle of about 15° to 45° from the main leader. This can be done by clipping off all branches growing under, and at times cutting off the ends. A trunk should be maintained free from limbs 3½ to 4½ feet from the ground. Earth should be kept away from the trunks, and if the top roots near the trunk are exposed, so much the better; it will assist the tree in breathing. The most careful cultivation is necessary, and nothing, after the fifth year, should be grown between the rows, unless you have plenty of water to irrigate by flooding all the ground once every eight weeks; if you are so prepared, sow your orchard in alfalfa, and do no cultivating."

† "Pruning the walnut is extremely simple and can be done by any one. When planting the tree, don't cut the top off of one-year-old trees, but it is absolutely necessary to cut back a two or a three-year-old tree; in fact, the finest young walnut orchard I know of in Orange County (and we have lots of fine ones down this way) was grown from two-year-old trees from 8 to 10 feet high, and cut back to about 4½ feet, and all limbs below that trimmed off, except three or four, which were allowed to grow up and make the top of the tree. Never prune the trees over 3½ feet, as the bark of a tree is easily sunburned, and thus it is necessary for the foliage to shade the trunk. If the lower limbs extend outward and are in the way of the cultivator, tie them up, for by so doing you can train the lower branches upward, so as to cultivate close to the tree, and when the orchard comes into bearing the limbs growing upward will not bend down to the ground with the fruit, so you cannot get within twenty feet of them with the cultivator."

‡ "In pruning it has been the custom to trim to a height of 6 to 7 feet, but I think 4 to 5 feet better. Such high pruning makes the tree top-heavy, and the prevailing winds cause them to lean, exposing one side of the trunk to the sun, thus causing sunburn. I think it best to trim little, if any. It is the nature of the tree to allow the limbs to grow downward and fill any space of account that may have been made by pruning, while if allowed to grow in their natural state, the limbs will start near the ground, growing upward and keeping out of the way much better than when allowed to hang down. I have not been able as yet to grow them just as I would like in this respect, on account of raising crops (mostly corn) between the trees, and I find it very difficult to save the lower limbs while young and tender, as a very little push or strain when plowing will injure them next to the trunk, and they should then be cut off to save the tree from greater injury than the loss of a limb. Avoid crotches or forks. If a tree is about evenly divided the abundance of foliage the tree has in summer will cause it to split with a very little wind, and you will thus lose the use of the tree for several years, if not altogether. If badly broken, start a new shoot near the ground, and in six years, with care, it will be a bearing tree."

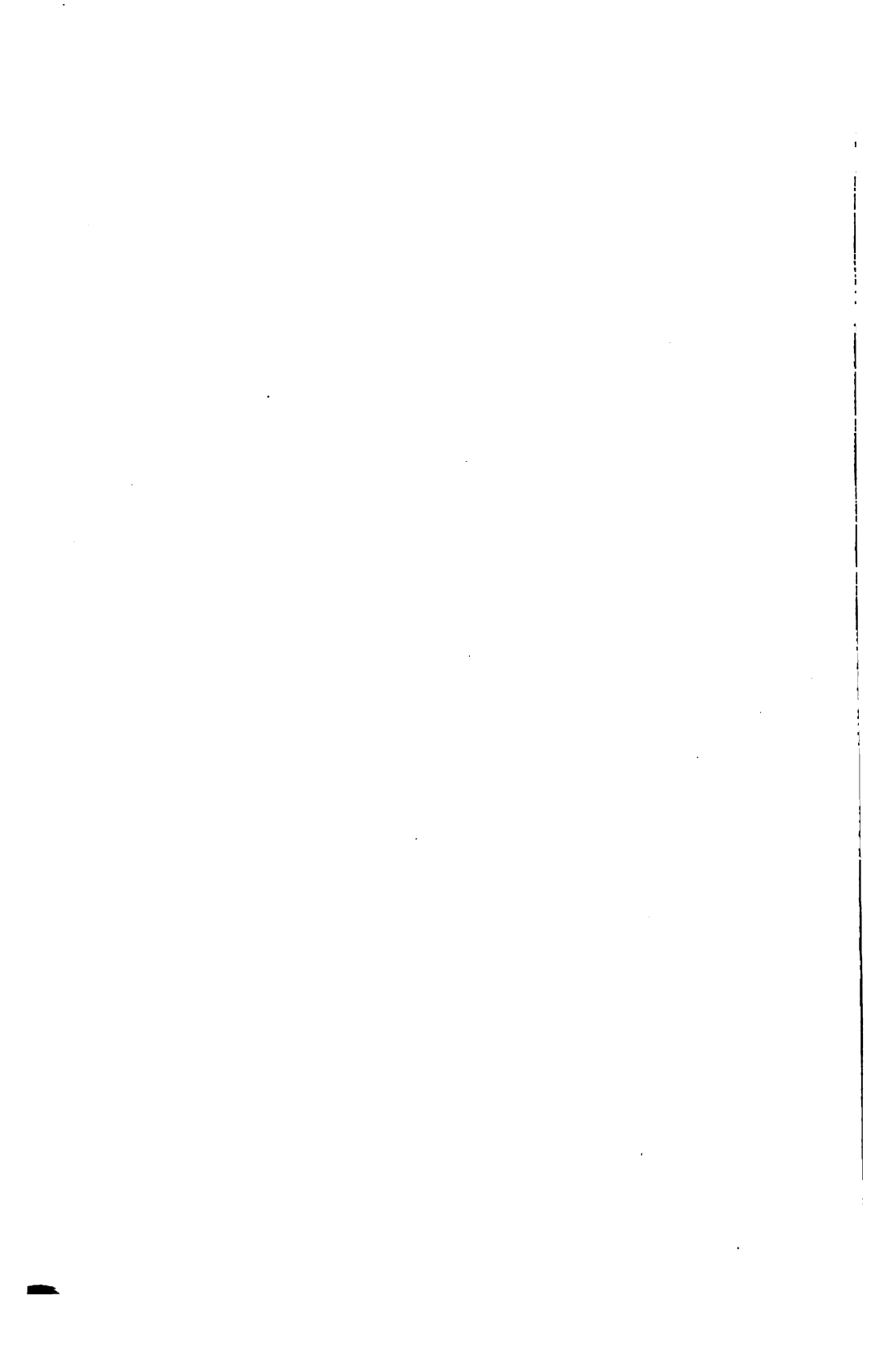
* Hon. Ellwood Cooper, Santa Barbara.

† George W. Ford, Santa Ana.

‡ C. A. Cauffman, of Rivera, in "California Cultivator and Poultry Keeper," October, 1896.



1. Prong-bud growing, showing the stock where first cut back and waxed over; also the twine tied loosely to prevent the opening of the bark and endangering the bud.
2. The bud prepared, ready for insertion into the slit in the stock.
3. The stock prepared, ready to receive the bud.
4. The bud inserted, before being tied.
5. The operation complete.—From photographs; natural size.



(13) HARVESTING.

Harvesting the walnut is very simple, as most of the nuts do not have to be picked, for they, of their own accord, drop to the ground at maturity; yet considerable attention must be paid to the gathering of the crops so as to have clean, bright nuts that may command a high price and ready sale. The walnut harvest begins in September and ends in November. In some sections the crop comes in quite early and is gathered in September, overlapping into October; in others, the crop is not harvested so early; but October is the principal month, sometimes overlapping into November.

Some of the growers collect the nuts from the ground as they fall every day, others collect them every other day, and some every third day, until most of the crop has fallen of its own accord, and those remaining on the trees are knocked down by means of a pole. Boys and men are also employed to climb the trees and shake the nuts down; others agitate the limbs with a long pole having a hook at the end. The nuts that are ready to drop come down easily, and are picked up and dried on trays in the sun. It generally takes from three to four pickings to gather all the nuts from a tree. When the husk inclosing the nut shows no signs of cracking it is an indication that the nut is yet unripe, and when knocked down the kernels of many of these generally dry away and do not fill well. Then, again, if the nuts are allowed to hang on the trees or remain on the ground too long after falling, they absorb moisture and rapidly deteriorate in flavor, color, and keeping qualities. In the walnut sections along the coast damp fogs and dew prevail during the harvest time, rendering the husks quite moist, and the nuts contained inside become stained by the acid juice of the husks, which, if not removed, renders the nuts quite black, and lessens their market value. This acid is very strong and adhesive, and to remove it the nuts have to be washed and afterward dried. Hon. Ellwood Cooper, of Santa Barbara, has a most perfect apparatus for washing and drying the walnut, which is an invention of his own. It consists of an iron cylinder with a long opening on the top side, where the nuts are put in. When the nuts are washed the cylinder will turn with the opening down, thus letting the walnuts and water out. As with all other apparatus of this kind, it has to be seen to be appreciated. They are made by the Fulton Iron Works, of San Francisco, and cost from \$125 to \$140.

* "The 'hard' shells should and the 'soft' and 'paper' shells *must* be gathered as soon as possible after dropping from the trees, as it injures the quality and appearance of the nuts to remain long on the ground. They are usually dried on trays about 3 feet wide by 6 feet long, holding about one hundred pounds each. 'Soft' and 'paper' shells should be dried in the shade, and many of the growers have buildings for that purpose. After they are thoroughly dried they are bleached and then run over a screen with a one-inch mesh, into strong sacks of uniform size, each sack bearing the registered trademark of the 'Los Nietos and Ranchito Walnut Growers' Association,' and also the name of the individual grower, thereby settling the question of responsibility in case the nuts are not up to the required standard."

† "There are different modes of gathering: some clean the trees at once, and others go over them several times. I pick what has fallen without knocking. I then tap those limbs lightly on which the nuts are ripest, and the third time over I aim to clean the trees. The walnuts are picked up and put in sacks and barrels, so as to be easily

* A. Downer, of Rivera.

† Joseph Sexton, essay before Ninth State Fruit-Growers' Convention, 1888.

handled, and hauled to a sunny place to dry, and should be placed on elevated platforms made of narrow boards, with spaces of one fourth of an inch between each board. The platform should be about 8 feet wide and 40 feet long, or as long as two men can handle a canvas to cover the beds, which should be done every night the dew falls. The nuts should be stirred in these beds once or twice each day, and with favorable weather they will dry sufficiently in three days, and are ready for market. I have always dried my walnuts by the sun and they have given good satisfaction, and for small orchards I think it is the cheapest and best way. Some dry by evaporation and claim it is preferable to the sun; that it sets the oil quickly and prevents the nut from becoming rancid. Others claim that it makes them so; but be this as it may, those having large orchards cannot depend on drying all by natural heat, and the drier will have to be used, even if it is not so good for the nut."

* "In handling the nuts, I cure in dry-houses by artificial heat, heating sufficient to evaporate the water and set the oil of the nut. When this is done the nuts will keep sweet for an indefinite time. I have kept them as an experiment, in my store-house, which is of concrete, for five years, and at the end of that time they were as sweet as when first cured. With my facilities, I cure them in eight hours. In preparing them for market, I have a washing apparatus—invented by Mr. Cooper—which I use if the nuts are discolored, as they often are by coming in contact with leaves or shucks when there is dew or rain. Directly after washing they are thoroughly dried and cured in the dry-house."

† "In gathering soft-shells, the nuts should not be left long on the ground, as the sun and fog will cause the shell to crack and the nut to become ruined. They should not be left long in the gathering-sacks, as they will then sweat and turn black. If the nuts are to be washed it should be done as soon as emptied from the picking-sacks, as they will then clean much easier. After this, spread in trays for drying. If to be bleached they should be thoroughly dry before. We use trays 3 by 6 feet, with sides 4 or 6 inches high, and a slat bottom with $\frac{1}{2}$ -inch space between slats. For the past few years all walnuts grown in Rivera have been scoured by placing them in a wire cylinder, washing them and revolving it for five or ten minutes, or longer if necessary to make them clean, then throw on water enough to wash clean before taking out of washer. This greatly improves their appearance, removing all fiber and pieces of hull that might be sticking to them. It also gives them a much smoother appearance. Now place them in trays, and dry."

ANNUAL AND BIENNIAL CROPS.

During many years the opinion entertained by many, that the walnut was a biennial bearer—that is, a crop could only be expected every other year—became prevalent, and was generally believed. This idea originated in the minds of some who could not be satisfied unless they saw *all trees* heavily laden with walnuts every year, and also owing to many of the orchards being planted to those singular and unproductive trees referred to elsewhere. On this account—the idea having become general—many hesitated about going into the business. As a rule, fruit-growers are not accustomed to wait for results, as one must do in the case of the walnut. Since the principal walnut plantations have come into bearing, this idea has been dispelled, it having been proved a fallacy. For about twelve years the orchards of twenty years ago have been bearing, and while they prove to be regular bearers, show that one year they bear a heavy crop, and the next one not so heavy, but a *crop* may be depended on every year; so that the walnut, while it may be considered a biennial bearer, must be classed as a tree producing regular crops, or a good bearer.

COMMERCIAL GRADES.

The walnut crop of the State is classified commercially under the following category, viz.:

Hard-shells include all nuts having a hard shell; these take in the numerous varieties of the so-called "English" walnut.

* Hon. Russell Heath, essay before Eleventh State Fruit-Growers' Convention, 1889.

† C. A. Cauffman, of Rivera, in "California Cultivator and Poultry Keeper," October, 1896.

Soft-shells include all nuts having a soft shell, and take in the improved varieties of the so-called "English" walnut, and foreign varieties of this texture.

Paper-shells include varieties of walnuts having an extra thin shell.

The walnut-growers of Southern California have agreed upon a uniform method of grading, which is by passing the nuts over a screen with a one-inch mesh, and making two grades only for the market. The paper-shells are kept separate, and sold as a fancy grade. The marketing methods adopted by the cooperative societies are to receive the nuts from the growers as they come from the orchard, and sulphur, grade, sack, and sell them.

The walnut is marketed in sacks, specially made, and holding about 120 pounds. Some, however, use the common grain sack, holding about 65 pounds. Before sacking, many growers place the walnuts in a wire cylinder of one-inch mesh, the friction of which on revolving gives the nuts a smooth appearance, and thus adds to their commercial value.

(14) ENEMIES OF THE WALNUT.

The walnut, so far, has fewer enemies than most trees, and the few that attack it are not considered detrimental to its culture in a high degree, for they are easily subdued. These are treated of separately in this chapter.

RED SPIDER.

Tetranychus telarius.

This spider, or mite, attacks different species of trees, shrubs, etc., also the walnut. It is very small, and can hardly be seen without the aid of a glass.

This insect, while not very troublesome on the walnut, is kept in check by dusting sulphur over the trees. The lime, sulphur, and salt solution, applied in winter, and the summer remedy, given below, have practically exterminated the pest on walnut trees.

Winter Remedy.—Unslacked lime, 40 pounds; sulphur, 20 pounds; stock salt, 15 pounds; water to make 60 gallons. Place 10 pounds of lime and 20 pounds of sulphur in a boiler, with 20 gallons of water, and boil over a brisk fire, for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place, the mixture will be of an amber color. Next place in a cask 30 pounds of unslacked lime, pouring over it enough hot water to thoroughly slack it; and, while it is boiling, add the 15 pounds of salt. When this is dissolved, add to the lime and sulphur in the boiler, and cook for half an hour longer, when the necessary amount of water to make the 60 gallons should be added.

Summer Remedy.—Sulphur, 3 pounds; caustic soda (98%), 2 pounds; whale-oil soap, 25 pounds; water to make 100 gallons. Boil the sulphur and caustic soda together in about 2 gallons of water; when the sulphur becomes dissolved, add the soap and boil until thoroughly dissolved, then add water to make 100 gallons of solution, and apply warm.

YELLOW SPIDER OR MITE.

Tetranychus.

Apply same treatment as for red spider.

WALNUT SCALE.

Aspidiotus Juglans regia, Coms.

The walnut is subject to infection from this scale peculiar to itself, and known as the walnut scale. The scale, however, has not proved a pest among our walnut trees. The old trees do not suffer from its attacks, as it infests the large limbs principally.

Remedy (applied when trees are dormant in winter).—Lime, 25 pounds; sulphur, 20 pounds; salt, 15 pounds. Take 10 pounds of lime, 20 pounds of sulphur, and 20 gallons of water; boil until the sulphur is thoroughly dissolved. Take the remaining 15 pounds of lime and 15 pounds of salt, and when thoroughly slacked, mix together and add enough water to make in all 60 gallons of solution; strain and spray warm.

BROAD-NECK BORER.

Prionus laticollis, Drury.

This gigantic beetle appears during July and August, but at times much earlier, and also late in winter. The beetle measures from 1½ to



Fig. 13.

2 inches in length. Color dark brown, nearly black. Possesses strong, thick jaws. In the male the antennæ are rather slender; in the female they are not so stout, and the body is much broader. The larva (Fig. 14) is a large borer with a broad neck. It measures from 2½ to 3 inches in length. The color of the larva is yellowish white. The head is quite small and is reddish brown. There is a light blue line down the back. As a rule it mostly attacks trees and vines just below the surface. It bores a hole through the center of the root, or into the trunk. On the trunk of trees and vines it never bores very deep, seemingly preferring

to work just under the bark. The larva cannot easily be discovered, for the reason that the trees do not begin to show the effects until the larva has had time to develop to its full size, when it becomes a voracious feeder. The larva remains in that state three days, and changes to the chrysalis state about the month of June, as the beetles generally make their appearance in July.

Remedy.—It is very difficult to ascertain the presence of borers before the trees indicate their presence. Walnut trees sometimes are observed to be bleeding (oozing sap) from a certain spot; this indicates a borer, or having been damaged otherwise. However, the cause should be

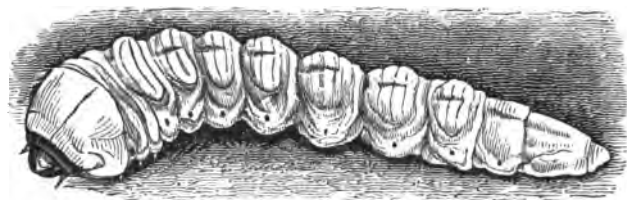


Fig. 14.

carefully looked into by cutting into the bark, and the borer destroyed. The wound should then be covered over with such material that will prevent the action of the atmosphere from injuring the tree.

SPAN WORM.

In 1891 there appeared in this State, at Santa Barbara, a caterpillar commonly known as the "span worm," infesting the walnut in great numbers, and in some places the trees were almost completely defoliated. The insect is easily subdued by the following remedy: Paris green, 1 pound; water, 200 gallons. The remedy is applied as soon as the caterpillars make their appearance in the spring.

WALNUT APHIS.

This insect attacks the walnut in some sections, and its exudations form on the tree a sort of "honey dew," which forms into a fungus and renders the foliage and husks quite black.

The black Australian ladybugs, *Rhizobius ventralis*, *Rhizobius debelis*, and *Rhizobius Toowoombæ*, have kept this insect in check, through which agencies the injury is not felt.

WALNUT BACTERIOSIS.

The only known disease, aside from "root knot," reported as attacking the walnut, which has caused some alarm, is a species of fungi.

*"It is not known as yet whether the primary cause of the trouble is due to some derangement of the vital functions of the plant or to parasitic organisms. The progress and destructive action of the disease are certainly very apparent. A small black spot first appears on the side of the nut husk while the kernel is still in the milk. The death of tissue beneath this spot gradually extends, spreading inward, and soon reaches the shell. Unless the shell is already hard the decay penetrates through the soft meat of the nut within, and the whole is soon disorganized and turns black. * * * A study

* Report of Division of Vegetable Pathology, Department of Agriculture, 1893, p. 272.

of the diseased tissue shows the presence of a bacillus, the organism being constantly present. Pure cultures of the bacillus have been obtained from spring inoculations, the tissue of the nut husk being too firm in the latter part of the season to test the action of the organism with any degree of certainty. Observations indicate that unfavorable root conditions for the trees may have an important bearing on the primary development of the trouble."

This disease was reported as being prevalent among walnut trees in the central part of the State in 1891. Since then, however, the trees are said to have recovered, and, on investigation, it was found that it was not this disease, but the trouble was caused by the soil drying out in the summer, causing the trees to lose considerable of their foliage and the nuts to shrivel.

This bacterial or mysterious disease has made its appearance in various walnut orchards in different parts of the State, and threatens to seriously affect the walnut groves unless checked by some effective remedy. The disease has been termed *Bacteriosis* of walnuts, by Prof. Newton B. Pierce, Assistant U. S. Pathologist, and is described* by him as follows:

"Bacteriosis of walnuts is a bacterial disease of the nut, branch, and leaf parts of the Persian walnut (*Juglans regia*). Inoculation experiments have demonstrated that other forms of *Juglans* may also be artificially infected by the organism. Under natural conditions the nut of the Persian tree is very commonly infected in the blossom, at or about the time of pollination. Secondary infections may take place through any portion of the hull of the tender nut, especially during the more rapid growth of spring. The new shoots and leaves may be infected at any portion which is tender and rapidly growing, but most of these infections actually take place at or near the growing point of such shoots, and only become distinct to the naked eye after rapid growth has left the infected part some distance down the branch. Injury to the cells of the nut, branch, or leaf parts is effected by the organism by means of an enzym, or ferment. This enzym acts chemically upon the tissues surrounding the point of infection, destroying the cells and preparing them as pabulum for the multiplying bacilli. This enzym is capable of destroying the tender cells of the hull, newly forming shell, and the contents of the kernel. As any or all of these parts become hard with age, less injury is done through infection by this germ. In case of blossom infection the nut is usually badly diseased, and, in a majority of cases, will fall when one third or two thirds grown. Lateral infection of the hull is less likely to wholly destroy the nut, but very commonly causes it to fall or the hull to adhere to the shell in such a manner as to make the nut unfit for market. Wherever the nut becomes infected the parts eventually turn back, owing to the oxidation of the tannic acid. When the disease is actually spreading, however, a circle next the healthy tissue usually assumes a watery appearance, which may be used as a character quite distinctive of this disease. This watery ring is where the enzym is acting upon the healthy cells often in advance of the presence of the organism itself. The characters here given for infected nuts are equally applicable to infected branches.

"The germs of this disease are capable of wintering either in the diseased branch or nut.

"The treatment of walnut bacteriosis has already shown some beneficial results. Over forty acres of spraying experiments were set on foot last spring. This work was done with the leading fungicides, but as the disease is now known to be of bacterial nature, it will be attempted to prevent the same by means of some of the leading germicides, with which, applied as winter sprays, it is hoped to obtain even better and cheaper results than with the standard fungicides. As this work is still in progress, and certainly cannot be completed inside of another year, it cannot be summarized at this time. It may be said, however, in absence of the perfection of better methods, that the Bordeaux mixture applied to the tree just before the growth of spring starts, and again to the nuts as soon after pollination as possible, will certainly prevent a portion of the infections which would otherwise take place. It has also been found of advantage to gather and destroy diseased nuts, and to prune away diseased branches during the winter. It is hoped that another season given to the testing of germicides may develop some more specific manner of preventing infection. No treatment looking to the cure of diseased nuts or branches may be hoped for; all treatment must be preventive."

In the "California Fruit-Grower" of October 17, 1896, Professor Pierce adds to the above the following note:

"The walnut disease has a wide distribution on this coast, extending as far north as Stockton, and south to San Diego County. There probably are, however, large intervening regions not affected. The disease does no special damage to the year-old wood

* In California Fruit-Grower, September 26, 1896.

only spreading a new growth, hence there is no danger whatever of the tree being killed outright—it is largely a matter of loss of crop and injury to spring growth. Its spread will largely depend on the atmospheric conditions each spring. Moisture of the atmosphere is favorable to the disease, and a dry atmosphere is unfavorable to it."

ROOT KNOT OR GALLS.

(Plate XVII, Fig. 2.)

Among walnut trees these so-called "root knots" or "galls" have of late been quite prevalent. The origin of this curious disease is not fully known, but, in some cases, it is the work of a minute insect—the nematode. So far, the best remedy is to cut away the knots or galls and completely remove the affected wood, and apply a solution of bluestone in the fall, as strong as the water will dissolve. This is applied with a swab, and the earth again thrown back. The safest way to use bluestone is in the form of *Bordeaux* mixture, which can be applied any time of year. Take sulphate of copper, 16 pounds; lime, 30 pounds. Dissolve the sulphate of copper in 22 gallons of water; in another vessel slack the lime in 6 gallons of water. When the latter mixture has cooled, pour it slowly into the copper solution, care being taken to mix the fluids by constant stirring.

(17) AREA OF WALNUT CULTURE IN STATE.

The walnut is now found growing throughout the State in almost every county. In 1892 a tree census was made by the State Board of Horticulture, through agents in the field, and the following acreage was found to be in walnuts:

County.	Bearing, Acres.	Not Bearing, Acres.	Total Acres.
Alameda	28	8	36
Alpine			
Amador	3	6	9
Butte	5	7	12
Calaveras	12	11	23
Colusa	20	40	60
Contra Costa		50	50
Del Norte			
El Dorado	3	5	8
Fresno*	10	60	70
Glenn	30	50	80
Humboldt	3		3
Inyo	1	3	4
Kern	30	41	71
Kings			
Lake	15	60	75
Lassen		2	2
Los Angeles	1,752	37	1,789
Marin		1	1
Mariposa	8	4	12
Mendocino			
Merced	7	7	14
Modoc			
Mono			
Monterey	7	16	23
Napa	12	28	40
Nevada	13	6	19
Orange	1,467	1,125	2,592

* Before Madera County was formed.

AREA OF WALNUT CULTURE IN THE STATE—Continued.

County.	Bearing, Acres.	Not Bearing, Acres.	Total Acres.
Placer.....	7	15	22
Plumas.....			
Sacramento.....	26	18	44
San Benito.....	35	9	44
San Bernardino*.....	131	70	201
San Diego.....	389	178	567
San Joaquin.....	27	42	69
San Luis Obispo.....	245	234	479
San Mateo.....			
Santa Barbara.....	1,117	786	1,903
Santa Clara.....	10	7	17
Santa Cruz.....	3	10	13
Shasta.....			
Sierra.....	2		2
Siskiyou.....	1	1	2
Solano.....	12	57	69
Sonoma.....	38	42	80
Stanislaus.....		3	3
Sutter.....	13	2	15
Tehama.....	4	26	30
Trinity.....	20		20
Tulare.....	4	8	12
Tuolumne.....	7	6	13
Ventura.....	997	5,308	6,305
Yolo.....			
Yuba.....	5	3	8
Totals.....	6,520	8,392	14,912

No reports were made from Alpine, Del Norte, Modoc, Mono, and Plumas counties, where it is doubtful, on account of climatic conditions, if walnut trees will grow. On the other hand, no reports were received from Mendocino, San Mateo, Shasta, and Yolo counties, where orchards of recent planting are located. Thus it will be seen that the bulk of the walnut orchards are in the lower counties, where the tree finds a congenial home and most favorable conditions essentially required. Ventura County leads, with 6,305 acres; Orange is next, with 2,592 acres; Santa Barbara is third, with 1,903 acres; then comes Los Angeles with 1,789 acres, San Diego with 567 acres, San Luis Obispo with 479 acres, and San Bernardino with 201 acres. The total acreage in the State in that year was given at 14,912 acres, of which 6,520 were in bearing. Readers no doubt understand how difficult it is to obtain accurate statistics, and while we make no pretention of the above figures being strictly correct, yet we believe they are approximately correct and show to what extent this industry is carried on in the various counties. The County Assessors are obliged to gather a complete tree census every year, and while they endeavor to comply with the law as well as they can, they are hindered from furnishing a true account through the laxity of the growers, who reluctantly give the figures of their orchards. The gathering of such statistics yearly, however, serves a good purpose, as the reports show where fruits of the different kinds are produced and the extensions that are made in this line.

* Before Riverside County was formed.

According to the Assessors' returns there were growing in 1896 the following number of walnut trees in the State, in the various counties:

Alameda.....	2,200	Marin.....	75	Sacramento..	3,272	Sierra.....	50
Amador.....	250	Mariposa.....	280	San Benito...	3,405	Solano.....	2,979
Butte.....	1,185	Madera.....	71	S'n Bernardi'o	11,500	Sonoma.....	4,286
Calaveras.....	500	Mendocino...	112	San Diego.....	19,491	Stanislaus...	270
Colusa.....	7,880	Merced.....	933	San Joaquin..	2,475	Sutter.....	2,734
Contra Costa..	4,650	Modoc.....	56	S'n L'is Obispo	17,595	Tehama.....	7,414
El Dorado.....	1,125	Monterey....	478	San Mateo.....	400	Trinity.....	50
Fresno.....	2,279	Napa.....	11,350	Santa Barbara	21,010	Tulare.....	350
Glenn.....	12,000	Nevada.....	3,000	Santa Clara...	11,601	Tuolumne....	985
Inyo.....	390	Orange.....	137,223	Santa Cruz....	4,580	Ventura.....	69,819
Kern.....	981	Placer.....	1,685	Shasta.....	2,406	Yuba.....	1,900
Los Angeles...140,675		Riverside....	7,803				
Total.....							525,753

NOTE.—The Assessor of Lake County returns the following figures, which are not in the above list, viz.: Under one year, 10,083; under two years, 351; under three years, 32; under four years, 308.

The walnut is generally planted at from 40 to 50 feet apart, and as an average 40 feet would be safe to calculate the acreage of the State. Therefore, allowing twenty-seven trees to the acre, at 40 feet apart, we have in the State 19,472 acres in 1896, as per Assessors' returns, of which 8,814 acres are in bearing, and 10,658 acres are non-bearing.

VALUATION OF WALNUT ORCHARDS.

As indicating the value of a walnut orchard (irrespective of the land or location), the following schedule of valuations, fixed by a convention of Assessors of the southern counties in 1891, is appended:

1 to 3 years planted.....	\$5 00 per acre.
4 years planted.....	10 00 per acre.
5 years planted.....	15 00 per acre.
6 years planted.....	20 00 per acre.
15 years planted.....	100 00 per acre.

(15) CULTURAL RANGE OF THE WALNUT (*Juglans Regia*) IN THE UNITED STATES.

According to "Nut Culture in the United States," the cultural range of the walnut in the United States is mostly confined to the Pacific Coast, and California in particular. *"East of the Rocky Mountains the Persian walnut has been most successful in a limited area along the Atlantic slope, from New York southward through New Jersey, southwestern Pennsylvania, central Virginia, North Carolina, and Georgia. The tree endures the winters in favored localities near the coast as far north as Connecticut, Rhode Island, and Massachusetts, but has never been planted there except in very small way. Some very fine old trees are reported from Rochester, N. Y., where they are in old gardens in the suburbs of the city. The finest and most fruitful specimens reported are at Fordham, N. Y., Princeton, N. J., Germantown and Philadelphia, Pa., and Georgetown, D. C., some of these being a hundred years old and bearing large crops of nuts of fair quality."

*"Nut Culture in the United States." Special Report, Department of Agriculture, 1896, p. 29.

A few trees are mentioned as existing at Marietta, Pa., at Red Hill, Va., at Fall Church, Va., in Delaware, Florida, and the Mississippi Valley, with fair and no success. In Michigan but few trees have been planted, and late experiments in a limited way in Indiana are quite promising, also in Kentucky and Tennessee. In Louisiana a few experiments promise well, but are very limited in scope, and the same is said of Texas. In Arizona the walnut has been planted quite extensively, and from specimens exhibited from there, that territory is bound to become a competitor with California in the walnut trade, and the same applies to Oregon, where the industry is now being pursued. In California the walnut finds the conditions for its culture the most favorable, and the industry is extending annually.

(16) WALNUT-GROWING IN EUROPE.*

By HON. EUGENE GERMAIN, U. S. Consul, Zurich, Switzerland.

In answer to a letter from the Los Nietos and Ranchito Walnut-Growers' Association of California, of June 4th, requesting information about the foreign walnut crop, I said:

"Switzerland does not grow walnuts on a large scale, but almost every farmer in the valleys has a few trees scattered on his ranch, and principally along the roadways. The annual output is small and some years not sufficient to supply the home demand. In years of abundance, a good article of salad oil is made from walnuts. The trees are hardy and not subject to scale, blight, or other diseases, the only serious enemy of the walnut being late frosts, of which there were none this season. The principal walnut-growing districts of Europe are France, Italy, and Austria-Hungary.

"I will at once take the necessary steps to obtain the information you desire, and within two weeks or so post you, if possible, on this season's crop outlook."

I now beg to inform the association, through the Department, that from reports I have received from the United States Consuls at Frankfurt, Vienna, Naples, Bordeaux, Marseilles, Castellamare, and Sorrento, I am able to report as follows:

Walnuts are, to a certain extent, as in Switzerland, grown all over Europe, but in most countries, such as Germany, Belgium, Holland, etc., the yield is small, and some years not sufficient to supply the home demand, the deficit being supplied from the more favored walnut-growing countries. Thus it will be seen that France, Italy, and Austria-Hungary are the only countries raising that article in sufficient quantities for export.

FRANCE.

The French walnut-growing districts are the departments of Dordogne, Corrèze, Lot, and the Grenoble district, in the department of Isère. The Grenoble nuts are of especially fine quality, being of the soft-shell variety, large, white meat, and running uniformly. These nuts yield the grower from 93 to 105 francs per 100 kilograms (about 8 to 9.18 cents per American pound). The latter price is for Grenoble nuts.

The crop in France this year is good. It compares favorably with former years, and is as good as in 1895. The 1895 crop was above the average, and that of 1894 below.

*Consular Report No. 192, pp. 149-151, September, 1896.

The principal points of export for France are Bordeaux, Marseilles, and Havre.

The trees in France are not subject to scale, blight, or other diseases. The orchards are mostly small and owned by farmers.

ITALY.

The Italian walnut-growing districts are the Neapolitan provinces around Naples, Castellamare di Stabia, and Sorrento. The points of export are Naples and Sorrento.

In Italy, this year's crop compares favorably with former years. Last year's (1895) crop was one fourth less than a medium crop and somewhat inferior to the average.

The principal growing district is Piassio di Sorrento. The trees are, to some extent, owing to climatic influences, subject to scale and blight diseases. The walnuts bring on an average \$9 25 per 100 kilograms, or from 4½ to 5½ cents per American pound. The extent of orchards is the same as in France.

AUSTRIA-HUNGARY.

The walnut-growing districts of Austria are in the lower part of the empire, or what is known as "Nieder Oestreich." In first line, comes what is known as the Steiermark, where the crop is a medium one; second, Mähren, a good crop; and third, Bosnia, where the crop prospects are excellent. Last year's crop was a light, medium one in the above-named districts, and the nuts, as a rule, are poor, not well filled, small, and of the hard, thick-shelled variety. In Hungary, the districts of Nagy, Bánya, and Grosswardein produce an excellent nut of good quality, large, white meated, and well filled, and, as my informant tells me, compares favorably with the French Marbeaux nuts. No figures as to prices are given.

The point of export for Austria-Hungary is Trieste.

Trees are hardy and not subject to diseases, as scale, etc.

WALNUT EXPORTS TO THE UNITED STATES.

In order that the California walnut-grower may know where he has to look for competition, and what quantities of walnuts are exported to the United States, I have copied and give below the points of shipment and the declared values of walnut exports in dollars (I am unable to get figures as to quantities) to the United States for the last two quarters of the years 1894 and 1895, these being the periods of the year in which

walnuts are gathered and shipped, and as given in the United States Treasury returns for the above-named years:

Whence Exported.	1895.	1894.
<i>French.</i>		
Havre	\$50,832 39	\$12,281 00
Bordeaux	156,579 01	82,282 00
Grenoble district	58,896 00	52,788 00
Marseilles	73,584 00	174,445 00
<i>Italian.</i>		
Castellamare di Stabia	2,624 43	71,809 32
Naples	10,256 00	19,755 85
Sorrento	34,076 00	None.

Austria-Hungary is not credited with any walnut export to the United States. The only other country growing walnuts which exports them to New York and San Francisco that I know of, is Chile. These, as a rule, reach New York and San Francisco in the month of August, and the only data I can find in the United States Treasury returns as to the walnut export from that source is that contained in the returns for the quarter ended September 30, 1894, in which Chile is credited with an export figure of \$5,844 48 for that year. No figures are given for 1895, and I presume no walnuts were received.

ZURICH, July 14, 1896.



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2.



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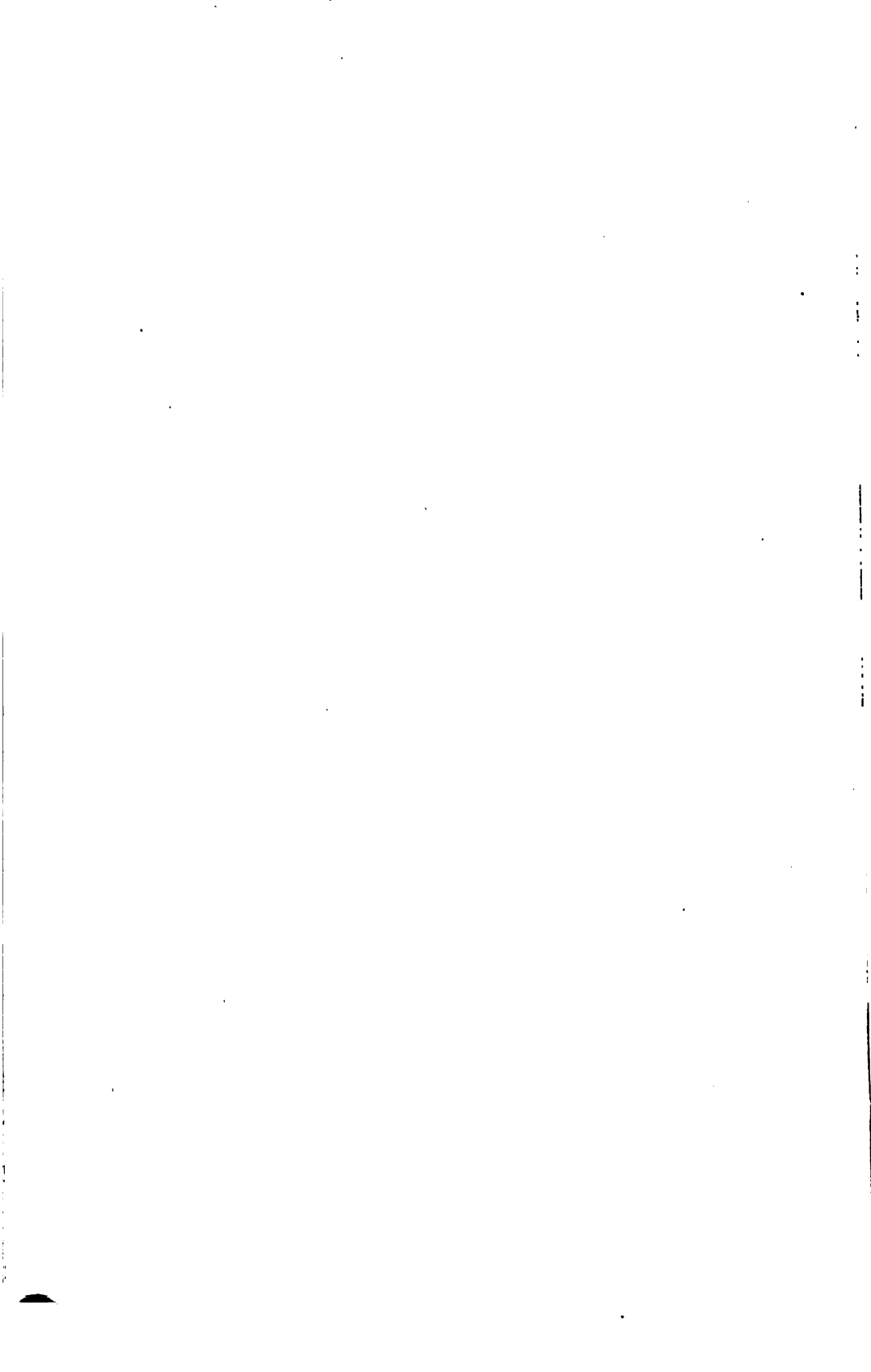


10.



11.

JUGLANS REGIA, JUGLANS NIGRA, AND JUGLANS SIEBOLDIANA.



EXPLANATION OF PLATE XXI.

THE WALNUT.

1. California Paper-Shell.
2. "English" (so called).
3. Mayette.
4. Japanese (*J. Sieboldiana*).
5. Franquette.
6. Ford's Improved Soft-Shell.
7. Cluster.
8. Rivera Soft-Shell.
9. American Black (*J. Americana*).
10. Improved Soft-Shell.
11. California Black (*J. Californica*).

EXPLANATION OF PLATE XXII.

THE WALNUT.

1. Fertile.
2. Mobart.
3. Serotina (St. John).
4. Gant (Syn. Bijou).
5. Grenoble.
6. Ford's Eureka.
7. Rivera Hard-Shell.
8. Præparturiens.
9. Charberte.



1.



2.



3.



4.



5.



6.



7.



8.



9.



PRUNING THE PRUNE.

BY

S. P. SANDERS, - - - OF SAN JOSÉ.

PRUNING THE PRUNE.

Prepared by S. P. SANDERS, of San José, at special request.

The French prune (Petit d'Agen) is a tree naturally erect and a symmetrical grower, having one main center stem, from which side branches put out at varying heights along the trunk, never two opposite each other; but, taking any given limb to start with, the next above it (if every bud starts) will be one sixth of the way around the trunk, and the sixth will be directly above the first. The limbs come out at nearly right angles with the trunk, and always have support from the wrinkled and knotty enlargements at their base. Thus, however thick and bulky the trunk may become, the side limbs that put out when the trunk was only the size of a whipstock, are found reaching from the very pith to the outer bark as a hard knot. The limb stands in the same position to uphold weight as a nail driven into a post, to hang your coat upon. The limbs, set at a right angle in the trunk, soon take an outward upward curve, and finally grow nearly erect, forming, with the center stem, which is always highest, a graceful cone.

I wish to show the agricultural design of a tree best adapted to sustain itself through the ordeal of bearing a crop of well-developed and fully matured fruit, and then be in proper form to repeat the effort year after year.

Object of Pruning.—The manner of training a prune tree is not merely a matter of fancy. Most people want it to bear fruit for revenue. It does not fill its mission if it is trained to form a thick, bushy top (Plate XXIII, Fig. 1), that shuts out the blessed sunshine from the small twigs and short spurs that grow on the limbs lower down. They would bear fruit and remain a permanent asset of the tree, but being deprived of sunshine, they perish and fall away without ever bearing a prune, leaving the main limbs naked, and putting the duty of bearing all upon the twigs which have struggled outward to find the sunshine. Neither does the tree fulfill its mission if it is allowed to break down or split apart when its crop is half grown, for the fruit, being thus arrested in its development, lacks some essential element, and turns out, in curing, bloated fruit, what are termed "frogs," also small, tasteless, inferior prunes, of which it will take a hundred to a hundred and eighty to weigh a pound.

When a tree is in good bearing it may be shortened in, if necessary, to gratify one's taste for symmetry, but if no radical changes are made, the tree will thenceforth distribute its energies so wisely that while it is maturing a moderate crop of fruit, it will also be extending its spurs and decorating them with buds of promise of future bearing. Some

orchardists think it profitable to clip back in detail the new growth on bearing trees, and some even to thin the clusters of fruit, but it seems hardly practicable to do one or the other in large orchards.

Shaping the Tree.—If the seed could be planted where the orchard tree is wanted, and the prune graft inserted into the seedling at the crown of the root, and allowed to make its growth unmolested, the tree, at four years of growth, would be in form nearly as described above—a graceful cone. The main limbs would be studded with twigs and spurs, which in turn would be set with fruit buds, and the orchardist's heart would be made glad in the promise of a crop in the fifth year. It would be wise, however, to tend the young tree and not allow more than six main limbs to remain, and these spaced along the trunk, the lowest one two and a half feet above the ground, the next one six or eight inches higher and a quarter way round the trunk, observing the same system with the other limbs, until the five or six limbs that are allowed to remain are located, each one clearly in possession of its rightful share of the parent stem, and none interfering with the equal rights of the others.

A tree thus started, and not cut or distorted, will, at the age of five years, begin to bear fruit. A photograph accompanies this paper showing such a tree (Plate XXIII, Fig. 4), one of a large orchard that has never been pruned. The trees, however, were grown in nursery and transplanted, instead of growing from the seed where they now stand. The natural setting of the limbs is plainly seen. Perhaps there are too many of them, but they will bear up without breaking or splitting away with any weight of fruit they will ever have.

A Common Practice.—Very seldom is an orchard seen in which the trees have been allowed to grow in their natural form. (Plate XXIII, Figs. 3 and 4.) The common practice has been, after setting an orchard of yearling trees which are whipstock size, to cut the stem off at from a foot to eighteen inches from the ground, thus destroying forever the plan of maintaining a center stem, but compelling all the limbs to grow in a cluster; and howsoever many may be allowed to grow they all shoot straight up, forming sharp and weak crotches which are easily split when the tree is large enough to bear fruit (Plate XXIV, Fig. 1), for then the limbs begin to lean outward under their weight of foliage and fruit. The power exerted by a constant downpull of hundreds of pounds of limb, foliage, and fruit, on the end of a ten or fifteen-foot lever, is vastly out of proportion to the resistance offered by the union where they spring from the trunk and are held together by a mere tissue of bark. The mischief was only begun when the yearling tree was cut back to a foot from the ground, for thus started it has been kept growing in the prevailing fashion, which dictates that the following year's growth must be cut back at least two thirds.

Wherever a limb is cut off you multiply by three the limbs in the following year's growth. There is scarcely an orchardist who will not, by the third year, be convinced that his trees are becoming too thick in the top, so he will begin to subtract, by taking out some of the tines of the forks formed by the two years of cutting back, yet cutting back the ones that are retained, thus multiplying by three again a little higher up. It is not uncommon, in an orchard modeled on this plan, to find trees (Plate XXIV, Fig. 2) which, at a level of five feet above the

ground, have as many as twenty-five branches, and as many as thirty-seven have been noted.

Cutting Back Young Trees.—If young trees are cut back, they will resent the treatment by doubling their effort in growing to repair the damage done. It is a mistake to suppose that you can throw the growth into the trunk or roots, or make sturdy limbs by cutting back. It is demonstrated by actual measurements that trees, at any period of their growth, not cut back, are larger than trees under exactly like conditions that have had their "annual shearings"; besides, by cutting back, the fruiting year is put afar off. Leave the trees severely alone, merely cutting out the vagrant growth, until they have gratified their ambition to become trees, and have "declared their intentions" of bearing by setting with fruit buds; then, if the twigs have formed too thick a network and are well studded with fruit buds—not till then—shorten them. Do not destroy them, nor let the limbs above destroy them by casting too dense a shade on them.

Results from Overburdened Trees.—Observations made by the University Experiment Station seem to point out that small, undeveloped prunes, and tough-skinned "frogs," come from overladen trees. Prunes from broken limbs of overladen trees make the poorest showing of any examined; those from the same tree, but from unbroken limbs, were but little better; that is, they all were under-developed, all were small, and gave the largest percentage of "frogs" in curing.

A tree may yield less than a hundred pounds of fruit and yet be overloaded. On account of lack of moisture, cultivation, or of food which it can assimilate, the fruit may be pinched and tough; but given a tree in good soil with sufficient moisture, carefully conserved by cultivation, yet breaking down under its weight of fruit, that tree is pleading for relief and should be severely thinned in the top, to that extent that will enable it to plump out its fruit with delicious pulp (Plate XXIV, Fig. 3), under a tender skin, which will easily crinkle in a weak, scalding solution of lye, will cure readily in the sun, and when finished will take from forty to seventy to weigh a pound.

The breaking of limbs, inferior size of fruit, resistance to the action of lye, and consequent tendency to "frog" in curing, are all directly traceable to overbearing.

To Prevent Overbearing.—Is it better to avoid all these troubles by relieving the tree of part of its task, and by so doing get a smaller crop of better fruit, and extending its useful life indefinitely, or is it better to crowd the tree to its utmost capacity now, regardless of its length of life, and try some method of masking the inferiority of its product, such as pricking the prunes to disguise the frogs?

Repairing Old-Style Trees (Plate XXIV, Fig. 4).—The practice of heading prune trees low and allowing a cluster of limbs to shoot from one common head, then cutting back from year to year, thus multiplying the limbs, has happily gone out and better systems now prevail. The mistake made, however, is not fatal nor entirely beyond repair. No doubt it shocks a tree to cut severely among its larger limbs, but heroic treatment is sometimes necessary, and it is better to reduce the bearing

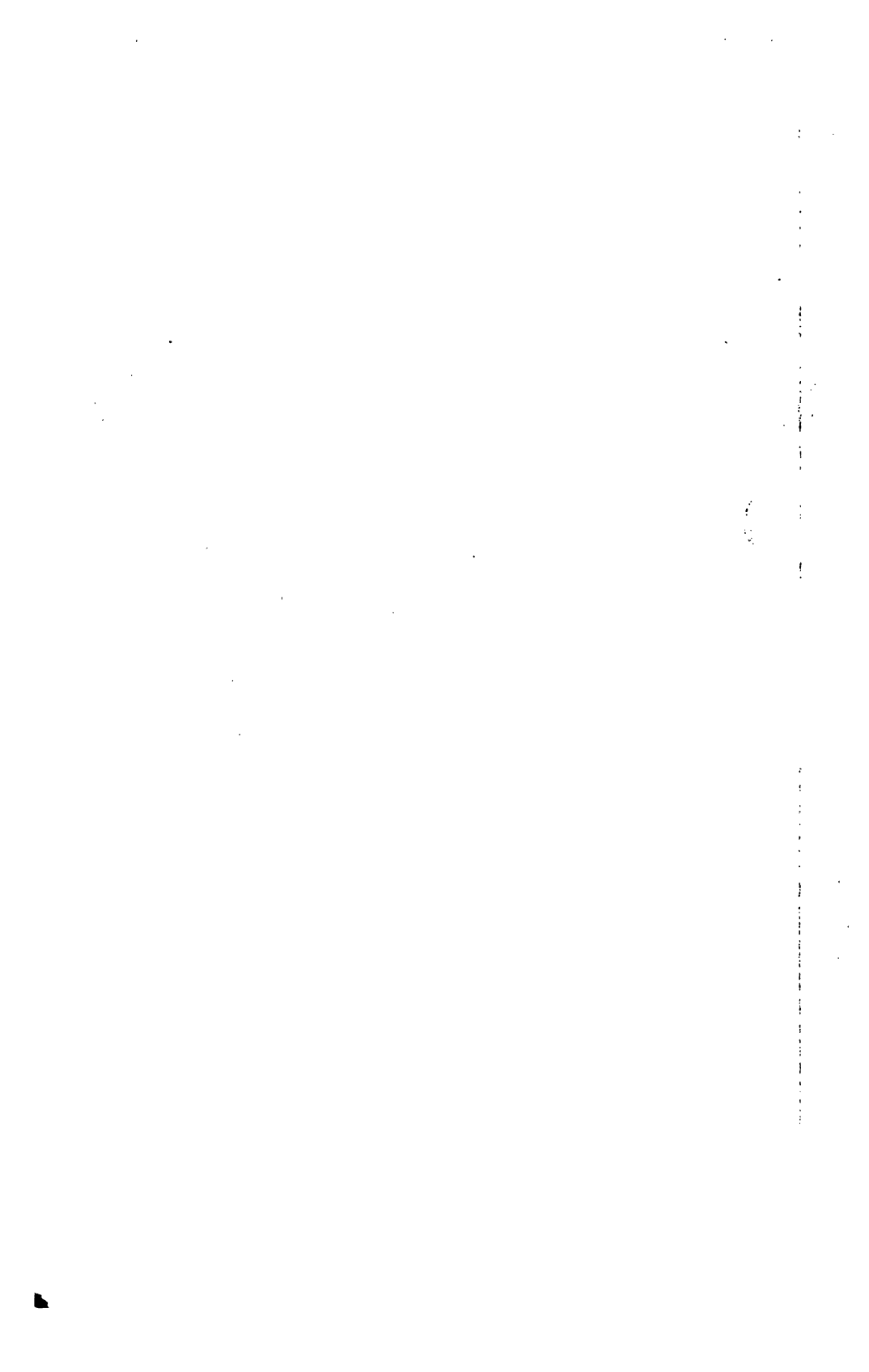
wood to the upholding capacity of the limbs, so that the clumsy and troublesome ropes and props can be dispensed with. Several devices are used to prevent splitting in the crotch, such as bolting through the trunk and across through the butts of opposing large limbs. Bale ropes may be used high up among the limbs to prevent them leaning away outward (Plate XXIII, Fig. 2), but ropes are short lived, require attention often to prevent strangling, or cutting the bark, and may give way at the critical time when most needed for support. A better plan is to use quarter-inch smooth fence wire, which has been toughened in the fire. Bore with a five-sixteenths inch bit through opposing limbs, where engineering skill says it will do the most good. Cut off a wire the right length to reach and protrude an inch and a half at each end, bend the end down, taking care to leave the hook lying lengthwise the wood. If it is necessary to strain a limb upward out of the team's way, put a leather strap having a ring at each end under the limb and use a rope with a hook and pulley to draw it up to the position where it is to be held by the wire. A rope used around the limb in raising it would wound the bark. The limb should be raised to the position where it is to be held by the wire before boring. In a short time the wire is grasped lightly by growth in the limb, and becomes a permanent fixture. It will not wear out nor rust away. Besides, iron is good medicine.

Thus, however much we may deplore the misshapen and ungainly appearance of these old trees, we may hold them together by mechanical contrivances and gather many crops of well-developed prunes, if we will further observe three cardinal points of care, which are: Feed the trees, cultivate the soil, and keep the bearing wood reduced so that the trees are not overburdened with fruit.

Illustrations.—The camera "doth nothing extenuate nor set down aught in malice," and by its aid I am able to show some trees of approved style, as well as some of the crippled ones. In getting the pictures it was too late in the season to show some of the trees in their saddest plight, for the broken limbs had mostly been removed, but nature has had her revenge, and they will not be likely to break again under a load of fruit for some years to come. They might have been saved for years of useful bearing by cutting away some of the forks and laterals in the top, thus removing a part of the weight from the ends of the long levers, reducing the burden to the capacity of the limbs, both to sustain the weight of fruit and convey the supply of nourishment for its development.



1. Too thick at top; has not borne yet.
2. One-third split; held by ropes and props.
3. Tree well started.
4. Naturally formed tree; has never been pruned.





1. Tree badly started; breaking away.
2. Tree badly started; kept from breaking by means of ropes.
3. Well-trained tree; sufficiently thinned.
4. Mode of holding limbs together; not recommended.

REPORTS
OF
ALEXANDER CRAW,

Quarantine Officer and Entomologist.



ENTOMOLOGY AND QUARANTINE.

REPORTS OF ALEXANDER CRAW,

Quarantine Officer and Entomologist of the Board of Horticulture.

To the Honorable the State Board of Horticulture:

GENTLEMEN: Since my last report (April 16th) seventy-two steamers and sailing vessels arrived in the port of San Francisco, having on board trees or plants. During the summer months importers receive very little stock from foreign countries, as the plants dry out more rapidly. Plants and trees during that time are brought in pots or balled, and that adds to the weight and expense. Tourists having but a few ornamental plants prefer them in pots or vases, as they can water and attend to them on the voyage. With the exception of araucarias, from Australia, very little nursery stock has been received.

The small, soft convex scale, resembling a *Lecanium*, but differing in having a margin of pink hairs or spines, found upon ornamental plants from Mexico, and referred to in my last report, has been kindly determined for me by Prof. D. A. Cockerell, of Las Cruces, N. M., as *Planchonia fimbriata*. The spiny scale upon ornamental plants from Hawaii, he named *Asterolecanium pustulans*, and considers it a particularly pernicious species.

On the steamship "Alameda" that arrived from Australia on July 3d, two members of the crew had six palms obtained at Samoa, infested with *Chionaspis citri*, and one with *Aspidiotus rossii*. The latter scale resembles *Aspidiotus ficus*, the red scale of Florida, but is larger and darker. It also differs in having a grayish-brown exuviae with black center. This scale is a very general feeder in Australia. The palms were destroyed.

On July 5th, a passenger on the steamship "City of Rio de Janeiro," from Japan, had three orange trees—in bearing—that were infested with three species of destructive coccids. These were the serious orange *Chionaspis* (*Chionaspis citri*), the long scale (*Mytilaspis gloverii*), and the wax scale (*Ceroplastis ceriferus*). The former species was the most numerous. I destroyed the trees; also seven variegated euonymus infested with *C. euonymi*, belonging to the Chief Steward.

On July 27th the steamship "Australia" arrived from Honolulu. A passenger had a number of plants, five of which were "papaws" (*Carica papaya*), that were infested with a new scale, *Lecanium longulum*, Douglass. Plants were destroyed.

On August 21st, a passenger brought six ferns from Honolulu that were infested with the "red wax scale" (*Ceroplastis rubens*). I destroyed the plants.

In writing to Hon. J. Marsden, Commissioner of Agriculture of the Hawaiian Islands, I mentioned the receipt of this scale. In reply he said: "The *Ceroplastis rubens* is present all over Honolulu, and affects a great variety of plants, but appears to do little or no damage. Mr. Koebele says that in Australia it does much injury to the Mango trees, but he thinks there is a parasite here that keeps it in check. The ferns you mention were taken by private parties. I have sent many things to California from our Government nursery. We take every care to have the plants clean at the nursery."

On August 25th, a warden case containing economic plants, spices, etc., arrived on the steamship "Peru," in transit from India via China to Honolulu. The case was marked S. L. J. & Co., San Francisco. Upon inspection, I found the plants in bad order, and infested with three species of *Aspidiotus*. I wrote to Mr. Marsden as to their condition.

September 21st, the "Gaelic," from Japan, had a vase of *Pandanus* plants for a lady of San Francisco, that were infested with a new scale, *Ischnaspis filiformis*. This scale is very narrow and dark, and resembles a *Mytilaspis*. The plants were destroyed.

September 26th, the steamship "Alameda" arrived from Australia and New Zealand. A passenger had five *Fourcroyas* infested with red scale (*Aspidiotus aurantii*). The plants were not fumigated, as they were intended for a section of the State where this scale is not found, so I destroyed them. On the same steamer was received a case of orange and persimmon trees for S. B. Heiges, Division of Pomology, Washington, D. C. The orange trees were not in good shape after their long voyage and were slightly infested with *Aspidiotus aurantii* and *Chionaspis citri*. I wrote to Prof. L. O. Howard, of the Division of Entomology, Washington, D. C., as to their condition, and he replied that the matter would be attended to. The surgeon of the "Alameda" brought two small orange trees in pots; upon examination, I found two male scales of *Chionaspis citri* upon one of the trees, but could not detect any females. As the trees were a new variety (Beauty of Glen Retreat Mandarin), I had them fumigated with hydrocyanic acid gas, and passed.

On October 19th, the steamship "Willamette Valley" arrived from Mexican ports with five hundred and five boxes of oranges from La Paz, which were slightly infested with long scale (*Mytilaspis gloverii*). They were quarantined as soon as landed on the dock. The owners agreed to have them fumigated, which was very effectively done with cyanide of potassium and sulphuric acid.

Scales and some of the insects referred to in my previous reports have been found and destroyed. As formerly, the most of the plants came from Japan. The following countries have also contributed: China, India, Australia, New Zealand, Samoa, Tahiti, Washington Island, Marquesas, Sandwich Islands, Central America, Mexico, and British Columbia.

Through the courtesy of the Southern Pacific Company we are notified of the arrival of plants by rail from outside of the State.

Probably the most troublesome insect during the past season has been the codlin moth. Complaints have been received of the failure of Paris green as a remedy for this pest. This has been so general that it would lead one to suspect adulteration. I would therefore suggest that the

Board officially ask the principal manufacturers to put up their Paris green for spraying purposes in sealed packages, of from one to ten pounds. This would prevent its adulteration with chrome green by unscrupulous retailers. I have prepared a short paper upon this subject.

An Eastern insect has been reported from two counties, San Mateo and Madera. It is a species of *Tingis*, and affects the trees in the same manner as aphid, by inserting their beaks and sucking the sap. In the former county they were found upon the leaves of the native wild cherry (*Cerasus aquifolia*), and in the latter county were found upon poplar trees. When full grown they measure one eighth of an inch in length, with broad, transparent, reticulated wings. They attack the under side of the leaves, causing them to become brown, with numerous small, gummy, black specks on the under side. In the East they attack hawthorn and apple. Three lots have been submitted to me upon apple leaves from Oregon. The same remedies that are applied for aphid will destroy them. All dry leaves and rubbish in infested orchards, or under infested trees, should be raked up and burned during the winter to destroy any hibernating females or eggs.

"Fuller's rose beetle" (*Aramigus fullerii*) has been found all over the State for over twenty years, but was never considered a serious pest. The past summer, however, they appeared in greater numbers and did some damage in cutting the edges of orange, lemon, laurestinus, and other trees and plants. Geo. A. Compere, Horticultural Inspector of Los Angeles, discovered the larvæ feeding on roots of chrysanthemums. In districts where this beetle has been troublesome the roots of those and similar plants should be examined during April, May, and June, and if the white grubs are found the plants should either be destroyed or treated with strong soap-suds. The beetles work mostly at night, and when disturbed they fold their feet and drop. By spreading sheets under the trees and jarring the leaves with a switch, the orchard could soon be cleared of them.

Notice of a new scale insect, discovered in San Bernardino, was recently published. As it was the same species (*Pulvinaria psidii*, Maskell) that I have occasionally found upon plants from the Sandwich Islands, and destroyed, I wrote to Mr. Samuel B. Parish, asking for an account of its introduction. In reply he said: "It was first observed by me in 1893, on a tree (plum) six or seven years old. It was one propagated by myself and grafted with wood from an old tree on my own place, so that the scale did not come to me on nursery stock. It had probably been on the tree a year or two before I noticed it, as it was then abundant. I at once dug the tree up and burned the wood. In 1894 it appeared on two or three nearby trees, and the present spring on the same trees and on one additional one. I then took them in hand and sprayed four times, at intervals of ten to fifteen days, with kerosene emulsion, very thoroughly applied. I have seen none of them since. Where they came from is quite a puzzle. I had not had any trees or plants brought on my place for two or three years before their appearance."

Mr. Parish has promised to notify me if they again show up. When in the larval state this family of scale insects look like small *Lecaniums*. Next spring, at the time they show the cottony secretion, a thorough search will be made by the inspectors to see that it has not spread to, or is to be found in, adjoining orchards or gardens.

were very plentiful when I visited the orchard, and we found they had spread slightly to adjoining orchards. I think that when they become better acclimatized their increase will be more rapid.

The minute ladybird (*Scymnus nanus*), referred to in my report of August 15, 1894 (and printed on page 437 of your report for 1893-94), found feeding upon "red spider" in the orange and lemon orchards of Rivera, Los Angeles County, had done their work so well that but few spiders could be found this season, and consequently but very few of this little ladybird were to be found during my visit in June last. Mr. Scott, later on—besides distributing colonies in his county—kindly collected a number of strong colonies at my request, and sent them to different sections of the State. I hope they will become established and spread from those centers.

The mealy bug ladybird (*Chryptolæmus montrouzieri*) has bred freely in confinement the past season, and a great many colonies were sent out; also very strong colonies of its co-worker, *Hyperaspis lateralis*, to districts where mealy bugs (*Dactylopius*) were found. Mr. John Scott received several colonies for different districts, and in a letter dated October 12, 1895, says:

"I was agreeably surprised yesterday, when I went to Monrovia to place the colony of *Chryptolæmus*, to find that the *Hyperaspis* was working well. I found larvae in the tree in which I placed the colony, and also in trees forty yards away a great quantity of the mealy bug is destroyed. I forward some for feed by express (prepaid), but not as much as I had expected; the large nests that I found a week ago are almost all eaten up."

G. W. Harney, of Yuba County, found the small Eastern ladybird (*Pentilia misella*) in great numbers in an orchard infested with "pernicious scale" in the foothills of his county. This species has been reported by Prof. L. O. Howard, of Washington, D. C., to be found preying upon the same scale in the Eastern States. Mr. Harney also reports that the internal chalcid parasite, *Aspidiotophagus* (*Coccophagus*) *citrinus*, is well established at Marysville on the yellow scale of the orange, and is doing good work.

We still propagate the *Vedalia cardinalis*, *Novius Koebelei*, and *Chryptolæmus montrouzieri* indoors, so as to be able to promptly supply all applications for them.

I would go more fully into this subject, to sustain your advocacy of this method of combating destructive scale insects, but time is rapidly proving that your policy has been wise and correct. We do not look for, nor have you ever stated that we can secure, complete extermination of our orchard pests by parasites; but who in California now fears the heretofore destructive "cottony cushion scale," the "pernicious scale," the "yellow scale," the "cottony grape scale," the "soft orange scale," the mealy bugs, and we soon can add all the *Lecaniums* to the list? All of the foregoing have been destructive in their time and have been regarded with dread by orchardists. With a more rapid breeder for "red scale," and the cleaning up of the purple scale, where it has been found, with hydrocyanic acid gas, we have not so much to fear in California. Of course, with the disappearance of their food, the parasites naturally disappear and the scale may show up again, but colonies of beneficial insects can again be liberated and clean them out.

Doubts have been freely expressed, in writing, by several prominent entomologists to orchardists and planters, as to the wisdom of relying too much upon parasites, but the work of the ladybird *Chryptolæmus* in

the coffee plantations and orange orchards of the Sandwich Islands is as great and quite as rapid as the *Vedalia* and *Novius* were in California. In a letter to me dated September 4, 1895, from the Hon. J. Marsden, Commissioner of Agriculture, at Honolulu, he says:

"The *Chryptolemus* has done wonderful work on these Islands; it has not only entirely cleaned out a *Pulvinaria* that threatened the total extinction of our growing coffee industry, but also a serious blight *Dactylopius albizzii* [a species of mealy bug] that was destroying all our citrus trees. The *Chryptolemus* bred to such an extent that ground and fences were covered with the pupæ, and looked as if we had had a snowstorm. Now it is seldom that any of the scale can be found, and the citrus trees are bearing good crops this year."

The above would seem to refute the following statement, recently made by one of the foremost entomologists of the day: "The ideas of the value of natural enemies which have become prevalent since the introduction of *Vedalia cardinalis* from Australia into California, to feed upon the fluted scale, are in a measure exaggerated, and it is not likely that another equally successful instance of the practical handling of natural enemies will soon be brought about."

Of course our climate and that of the section where the writer of the above resides, are not to be compared, and this has something to do with our success. We feel encouraged, and all disparaging statements will have no depressing effect upon us, in our search for more natural enemies. A gentleman that stood high in his profession remarked to me that "he did not believe in the indiscriminate introduction of beneficial insects, as they would only supplant our native species." As the latter had not shown that they were capable of keeping the destructive imported ones in check, I could not see that any harm would result, as such insects themselves cannot become a pest.

I again desire to express my appreciation, and thanks to the heads of departments and officers of the custom service, also to the various dock officials, for their valuable assistance in my quarantine duties. To Mr. Charles Fuchs, of this city—an acknowledged authority upon *Coleoptera*—my thanks are due for his kindness in determining various specimens referred to him.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer.

SAN FRANCISCO, November 4, 1895.

To the Honorable the State Board of Horticulture:

GENTLEMEN: During the past six months there arrived in the port of San Francisco fifty-three steamships and sailing vessels that had trees and plants on board. The receipts consisted of 437 cases and crates of trees and plants, and 387 lots in small boxes, baskets, and loose. Out of these, 2,674 fruit trees and ornamental plants were rejected and destroyed, as they were infested with insects new to the State. The insects found were principally scales, and some borers. Of the scales, the following list will be of interest:

In 1891 I reported the existence of the "Florida or Cuba red scale" (*Aspidiotus ficus*, Ashmead) on *Ilex latifolia*, from Japan. Only a few scattering scales were then found, but this season a shipment of *Aspi-*

distria lurida, from Osaka, Japan, was very seriously infested with this destructive orange scale. Pomelo oranges from China were slightly specked with this pest, showing the existence of it in that country.

The true "red scale" of the orange (*Aspidiotus aurantii*, Maskell), I found upon cocoanut palms from Central America. They were not very numerous, which would indicate its recent introduction there, or the existence of a parasite that holds it in check, for this is the first time that I have found this scale coming from Central America.

From Acapulco came five ornamental plants like Anthuriums, that were infested with scales belonging to the family of which the "purple," the "long," and the "oyster-shell" species have made this group very much to be feared by fruit-growers in the countries where they are found. This one was new to science, and named *Mytilaspis carinata* by the well-known coccid authority, Prof. Theo. D. A. Cockerell. Another new species of this family is *Mytilaspis crawii*, Cockerell. This is a very difficult one to detect, due to its mining habit, smallness, and color. It was found on *Quercus cuspidatus*, and a species of eleagnus from Japan. From the last named country came plum, walnut, and cherry trees infested with the very destructive white scale (*Diaspis amygdali*, Tryon). This species slightly infests the stems and roots under the surface of the soil, like *Aulacaspis rosæ*. Another white scale from Japan was *Chionaspis difficilis*, Cockerell, covering the stems and branches of the fruiting eleagnus. *Chionaspis euonymi*, Comstock, came on euonymus from Japan. Prof. L. O. Howard reported this species as attacking citrus trees in Louisiana. Prof. Comstock reported it on the Japanese *Euonymus latifolius* at Norfolk, Va. The new *Lecanium* (*L. longulum*, Douglass), referred to in my last report, I found upon three other kinds of plants from Honolulu, viz.: ferns, crotons, and casuarinas. The "red wax scale" (*Ceroplastis rubens*, Maskell) was found on orange trees, alligator-pear trees, and ferns from Honolulu. Our common "black scale" would have to be re-christened should *Lecanium nigrum* of the Sandwich Islands get a foothold here. This scale is smooth and of a shiny black color in the adult stage, and from the condition of the infested plants that I destroyed I think it would hold its own against *Lecanium oleæ* as a breeder. A new "mealy bug" (*Dactylopius pandani*, Cockerell) came on screw pines (*Pandanus*) from Marquesas Islands.

The "long scale" (*Mytilaspis gloverii*, Packard) infested crotons from Honolulu, and palms and lime trees from San José del Cabo, Mexico; and the "purple scale" (*Mytilaspis citricola*, Packard) was on lime trees from Guatemala. On the usually clean camphor trees from Japan I found *Aspidiotus duplex*, Cockerell. This scale also infests camellias, orange, azaleas, *Olea fragrans*, and *Myrica rubra*.

While heretofore the Japanese have confined their trade to furnishing the United States and Europe with ornamental stock and bulbs peculiar to their country, they now propose extending their trade by cutting into our home nurseries, and offering fruit trees of American and European varieties at prices that would mean bankruptcy to our nurserymen. One hundred samples of one-year-old apple trees, five to six feet high, from the graft, came forward this season, but were burned, as they were infested with scale insects. Fruit trees and general nursery stock are admitted free of duty, and plants used for forcing under glass for cut flowers or decorative purposes are charged a duty of 10% ad valorem.

On Sunday, April 19th, the steamship "Gaelic" arrived from Hong-kong. A passenger en route to Ireland brought a male and female mongoose from India. Experience in the Sandwich Islands and in Jamaica has shown the disastrous results of importing the mongoose in the hope of destroying rats and other ground pests. Under your Rule XII, "animals detrimental to fruit or fruit trees, plants, etc.," are prohibited from landing, so they were detained on board. I telegraphed to the Department of Agriculture at Washington, D. C., notice of their arrival, and received a telegram in reply from Assistant Secretary Chas. W. Dabney, to the effect that the Department knew no law to prevent their introduction, but that every effort should be made to discourage their being landed. The owner expressed his intention of visiting the southern portion of the State and taking the animals with him; this brought them under your regulations. The danger of the female escaping, through an accident or carelessness, was too great, so they were held, and before the ship sailed (April 25th) the surgeon of the "Gaelic" killed them with chloroform. Under date of April 21, 1896, Assistant Secretary Dabney wrote: "If the mongoose once gains a foothold in California it will probably increase rapidly, and the damage resulting from the destruction of small mammals and insectivorous birds, and the consequent increase of insect pests, will be incalculable."

There is no national law or regulation to prevent the introduction into the United States of even such a terrible pest as the Australian rabbit, and as there are other ports of entry, outside of the State of California, where they can be landed, I consider it would be a wise procedure for Congress to enact a stringent law leaving no loop-hole for thoughtless or careless people to bring such pests. I have suggested this matter to the Department of Agriculture.

Having no funds at your disposal, I have been without assistance for the past nine months, so my time has been taken up entirely with quarantine duties and correspondence.

I have to acknowledge receipt of four boxes of ladybirds, on December 13, 1895, from Hong Kong, China, kindly forwarded by Mr. Albert Koebele. They are all aphid-eaters, and were in very good order. One species (*Synonycha grandis*) measures nearly half an inch across. Over sixty were liberated in an apple orchard in Alameda County. The other three species were turned loose in the same orchard. Corn-husks (inverted) were tied upon the branches as a protection and for them to hibernate under.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer.

SAN FRANCISCO, May 1, 1896.

REPORTS
OF
COUNTY HORTICULTURAL COMMISSIONERS.



XVI.

REPORTS OF COUNTY HORTICULTURAL COMMISSIONERS.

The following letter was mailed to all Secretaries of County Boards throughout the State:

OFFICE OF STATE BOARD OF HORTICULTURE, }
SACRAMENTO, CAL., August 14, 1896. }

To County Horticultural Commissioners:

GENTLEMEN: Sections 4 and 17 of the laws of 1889 (Stats. of Cal., pp. 89 and 413) provide: "It shall be the duty of said County Boards of Horticultural Commissioners to keep a record of their official doings, and *to make a report* to the State Board of Horticulture, on or before the 1st day of October of each year, *of the condition* of the fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting and as to quarantine against insect pests and diseases, and as to carrying out of all laws relative to the greatest good of the fruit interests. Said Board shall publish said reports in bulletin form, or *may* incorporate so much of the same in their annual report as may be of general interest."

We beg to request that all County Boards (except where there is but one Commissioner) meet and consider their reports to be made to the State Board, and not send same, as has been done, in the form of an individual letter without the approval of the other members.

We also beg to request that the reports be filed, if possible, by September 15th, in order to prepare same and embody in our report.

Respectfully,

ELLWOOD COOPER,
President.

B. M. LELONG,
Secretary.

The following reports reached us in time, and are the only ones received:

FRESNO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: We, the Horticultural Commissioners of Fresno County, beg leave to submit the following annual report:

The total number of orchards inspected in the county is 2,035, representing a grand total of 1,575,323 trees, of which 1,483,616 are deciduous fruit trees, 48,267 orange trees, 11,267 lemon trees, and 32,173 olive trees. The respective varieties of deciduous trees represented are as follows: apple, 31,425; pear, 225,791; peach, 789,657; plum, 51,851; fig, 90,574; cherry, 3,462, and almonds, 20,979.

The number of orchards found to be infested with pernicious scale is 988, leaving 1,047 orchards now apparently clean. The total number of deciduous fruit trees imported into the county during the season is 341,099; of orange trees, 65,360; lemon, 725; grape-fruit, 270; olive, 5,945; chestnut, 3,000; all of which were duly inspected upon arrival. The total number of deciduous fruit trees exported from Fresno County during the season is 158,467, and of orange, 2,261; lemon, 234; olive, 7,856; also, 50,000 grapevines and 390,000 grape-cuttings. In all cases where scale was found to exist upon trees inspected, the owners or

persons in charge or possession thereof were duly notified to eradicate the same, and in every case where refusal or neglect of that duty occurred, the Commissioners in charge of such districts proceeded according to law, and enforced the spraying of said trees.

In all, 45 orchards were sprayed by the county spraying outfit, the expense of which, upon all orchards where owners did not pay at the time of spraying, became a lien upon the property. In nearly all of the other infested orchards the work of spraying was cheerfully performed by the owners, and their hearty coöperation with the Horticultural Commissioners will do much to lessen the ravages of many damaging insect pests.

The codlin moth has damaged the fruit interests in Fresno County to a very great extent for many years—so much so that a majority of the growers of apples and pears had about despaired of ever succeeding in making anything out of their orchards, which have cost them such large sums of money and so many years of hard labor; but the present year the Horticultural Commissioners succeeded in having a large number of apple and pear orchards sprayed with Paris green, and are now in a fair way to bring into profitable production all of the apple and pear orchards of the county. It is estimated that the saving to the owners of the pear and apple orchards in this county this year (the first time that anything like general work has ever been attempted) will range from \$25,000 to \$50,000, which should and will be greatly increased in years to come.

The red spider has spread to an alarming extent, and has this year been the cause of great damage to the fruit trees, and to fruit of nearly every description, the trees in many prune and other orchards being entirely denuded of their foliage, leaving the exposed fruit to dry and wither on the trees. A thorough battle of extermination will be waged at the proper time by the Commissioners.

Great fear is still entertained by the people here that through carelessness or neglect on the part of quarantine guardians, the fatal disease of "yellows" may yet be introduced into California. Too strict measures could not be enforced for our protection in this particular instance.

We are to some extent troubled with cottony-cushion scale, woolly and plum aphis, but they are as yet considered minor difficulties. Root knot upon nearly all deciduous fruit trees is becoming more and more prevalent, and is a formidable obstacle in the way of propagating trees in the nursery; so far we can only destroy them, as we have already done by the thousands, when found. When the secret of this trouble is discovered, and a remedy or preventive found, it will be a boon to California. Altogether, the condition of the fruit interests of Fresno County is very prosperous, and the matter of successfully growing citrus fruits here is fully established. The owners of bearing orange orchards are already shipping many carloads of that fruit annually. The entire shipments of raisins, green and dried fruits, etc., during the year ending September 1, 1896, from the seven points, Fresno, Malaga, Fowler, Selma, Kingsburg, Sanger, and Reedley, are as follows: Raisins, 2,725 carloads; dried fruit, 350 carloads; green fruit, 436 carloads; oranges

(from the town of Sanger), 27 carloads, or equal in all to a railroad freight train 30 miles in length.

All of which is respectfully submitted.

J. R. BAIRD, President,

J. A. ROSE, Secretary,

J. F. McDONALD,

County Horticultural Commissioners.

FRESNO, September 1, 1896.

LOS ANGELES COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I have the pleasure to submit the following report:

The past season has, on the whole, been very unfavorable to the fruit-growers in Los Angeles County, the extremely cold weather last winter having done great damage to the orange and lemon crops. In some low-lying localities trees were frozen and much fruit spoiled. The most serious damage, however, was done to the coming crop. The trees, both orange and lemon, bloomed profusely, and a great crop was anticipated, but two thirds or more of the young fruit dropped, resulting in leaving little more than half a normal crop for the coming season. Deciduous trees also suffered severely. Many peach and prune orchards did not leaf out until June, and then only partially, and the crop was very light. Apricots also were below the average, and olives will be almost a total failure.

There was a shortage of rainfall last winter, which also contributed to the general failure of the crops. Many districts are now suffering for want of irrigation water, and should we have early rains, accompanied by warm weather, the trees will bloom prematurely, and thus materially injure the crop of next year.

The light rains interfered with planting, and much land was not set out to trees that otherwise would have been. Nurserymen grubbed up and burned thousands of trees; to such an extent, in fact, that at the latter end of the season orange stock became very scarce and high priced. The supply of good Washington Navel stock will be short this coming season.

The fungus that I mentioned in my report of last year, and that promised early in this season to do great damage to the walnut trees here, was materially checked by the dry, warm weather in the spring, but will no doubt again make its appearance when the weather conditions are favorable.

Scale pests have not been so destructive to orchards as in former years. The pernicious scale has in many localities entirely disappeared. The red scale is still decreasing, and is now, with a few exceptions, confined to old seedling orchards south of Los Angeles City. The extreme heat has destroyed at least 90% of the black scale.

The *Orcus chalybeus* has entirely disappeared. Not a single specimen is to be found.

The *Rhizobius ventralis* has now got a foothold in a number of orchards between the City of Los Angeles and the coast, and has done good work, but along the foothills and in the interior it is still a failure. I am distributing colonies (of about one hundred) daily, free of charge.

The price of cyanide of potassium having dropped almost one half,

fumigation is becoming general in localities where the black scale is still troublesome.

We have made many attempts during the past season to eradicate scale by steaming the trees, but so far have met with little success. The results are much more uncertain, the danger of injuring the trees greater, and the expense as great as the cyanide process.

Respectfully submitted.

JOHN SCOTT.

LOS ANGELES, September 24, 1896.

MERCED COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In complying with the law in regard to the horticultural interests of Merced County, I will state that there is a decided improvement in the condition of the orchards of this county. I find that the scale is not nearly so plentiful as it was a year ago. I also find almost every one owning an orchard ready to comply with the law. With the remedies at hand, there is no trouble to get rid of all the fruit pests with a little work. In most of our young orchards the trees are raised in this county, and do better than trees brought in from other districts. Our trees here are looking better than they have for four or five years; less spider and yellow mite than for years; fruits of all kinds are better and cleaner this season, showing that care is everything when it comes to raising good fruit in California. There have been a great many trees planted in this county the past season, mostly peaches, as Merced is becoming one of the great peach counties in California. The prospects are bright for planting a great many young orchards another year.

Respectfully submitted.

H. A. W. TORCHIANA,
President.

N. H. WILSON,
Secretary.

MERCED, September 12, 1896.

ORANGE COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: It is plain to us that horticulture in Orange County is yet in its infancy. The conditions of success are but imperfectly known. Up to this time, citrus culture has been the chief industry. From six to eight hundred carloads have been annually shipped away, and, since the organization of the exchange system, the returns have been moderately fair. Many changes have taken place in our groves; some of the early plantings have been removed, and better varieties have been planted in their place; others have been cut back and budded to choicer kinds.

Pests.—These may be classed as two kinds: plant diseases and scale bugs. Of the former, we have several varieties, concerning the remedies

for which, we as yet know but little. Of the latter, we have the red, white, black, and purple scale, all of which are very pernicious. Besides these, we have many other varieties, less destructive, because subject to native parasites.

Beneficial Insects.—It has been and still is the care of this Board to use and encourage the use of beneficial parasites to the utmost, believing there may yet be found an enemy to each and every variety of scale pest. The white cottony-cushion scale is held in perpetual check by the *Vedalia cardinalis*, care being taken on our part to keep enough of them on hand to supply new developments of the scale.

On the red scale (*Aspidiotus aurantii*) we have several varieties of native ladybirds and parasites working, but all of these combined do not avoid the necessity of spraying or fumigating at least once a year. This is a very heavy tax on the industry.

For the black scale, we have been supplied quite liberally by the State Board of Horticulture with the *Rhizobius ventralis*. The success of this has been but partial.

The purple scale (*Mytilaspis citricola*) is a new pest in this county, brought from Florida on nursery stock. For this we have found no remedy but fire.

The insecticides for the red and black scales are:

First—Fumigation by hydrocyanic acid gas for large trees;

Second—Resin wash for small trees.

Formula for fumigation: 6 ounces of 98% cyanide of potassium, 6 ounces of sulphuric acid, 12 ounces of water, for each 1,000 cubic feet of tree. Time to each tree, 40 minutes. The night is used to avoid light, heat, and seabreeze.

Formula for resin wash: 15 pounds of resin, 5 pounds of caustic soda, 3 pints of fish oil, boiled three or more hours in 100 gallons of water.

Application of fumigation, once a year, and of the resin wash, twice a year.

Our deciduous fruit industry consists of all the varieties raised in temperate and semi-tropic countries, and walnuts in addition. Walnut-growing promises soon to be the leading industry.

The county is divided into three horticultural districts, each of which is under the charge of one Commissioner, who is his own Inspector.

Quarantine.—During the season of planting, a close quarantine of all imported nursery stock is maintained. A local ordinance by the Board of Supervisors makes it a misdemeanor for any one to bring into the county, nursery stock without reporting the same immediately to the Commissioner of the district.

A few years ago a "mysterious disease" appeared in our vineyards that destroyed every vine. Since that time the grounds have been replanted, but the presence of the old disease is apparent.

A bacterial disease has appeared in a few places on growing walnuts, but no serious damage has yet been done. Measures are being taken to remedy it.

I. N. RAFFERTY,
HIRAM HAMILTON,
L. G. HUNTINGTON,
Commissioners.

PLACER COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In accordance with the law, we beg leave to report as follows:

We have, during the past season, discharged our duties as County Horticultural Commissioners in as full a manner as possible. The fruit trees were sprayed in the winter for scale, with lime, sulphur, and salt, and later with Paris green, for codlin moth. We also instituted a strict quarantine for the prevention of introducing trees diseased in any manner, or of shipping any without inspection.

Unfortunately, our fruit crop has proved an entire failure in the portion of the county north of Auburn, and the crop in other portions has been very inferior. The grapes escaped injury.

Mr. Baker, of our Board, has found phylloxera to a slight extent in a vineyard near Colfax.

Respectfully submitted.

W. M. BAKER,
Chairman.
GEO. W. APPLGATE,
Secretary.

AUBURN, September 18, 1896.

RIVERSIDE COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In transmitting our annual report for the present year, we have thought best to briefly mention the fruit-growing districts of the county, in order that you may have an adequate idea of our horticultural resources.

The extreme western one fifth of this county is about all of it that is productive, the balance being desert and mountains. In this area of about 1,200 square miles is found all of the agricultural and horticultural, and much of the mineral, wealth of the county.

In the northern part of the county, along the line of the Southern Pacific Railroad, are the towns of Banning, Beaumont, and El Casco. At Banning there is a prosperous colony, possessed of splendid land and abundant water-supply. Here all kinds of deciduous fruits flourish, the colony being especially famous for its prunes, apricots, and almonds. About two thousand acres are devoted to these fruits. A large amount of new land is being planted, and the colony is growing every year.

At Beaumont there are several hundred acres devoted to horticulture; apples, cherries, and peaches being their principal products, but almonds and apricots being also largely produced. Beaumont is not so fortunate as Banning as regards a water-supply, but, having a heavier rainfall, less irrigation is required.

At El Casco the principal industry is dairying, but horticulture receives considerable attention, and much fine fruit is produced.

A few years ago the Moreno and Alessandro Valley had as bright prospects, from a horticultural standpoint, as any locality in the State. With a fertile soil, an industrious and thrifty people, and what was thought to be an abundant and cheap water-supply, the horticultural

future of this valley seemed assured. But at present, owing to complications with the water company and the uncertainty attending the outcome of the litigation over the Wright irrigation law, the work of development, so auspiciously begun some years ago, has been practically suspended, and no new movement seems possible under present conditions. However, with a settlement of their present difficulties, a resumption of their old-time progress could be confidently expected to soon place this valley in the front rank of the fruit-growing districts of our county.

Perris, being subject to practically the same vicissitudes as Moreno, is in much the same condition. In neither of these settlements has there been any considerable new planting the past season, the high price of water and difficulty of obtaining it serving to discourage enterprise in that direction.

In the colony of Lakeview some tree-planting has been carried on and several quite important orchards have been set, but, owing to trouble in regard to the water-supply, development has been limited, and at present is practically at a standstill.

San Jacinto, Hemet, and Florida comprise what is at present the principal deciduous fruit producing district in the county. Situated near the San Jacinto Mountains, liberally watered, much of the land being moist and not requiring irrigation, this part of the county is particularly favored in the matter of being adapted to horticulture. The Lake Hemet Water Company supply the Hemet lands with abundant and cheap irrigation. Much of the San Jacinto land is moist, and what is not is supplied with fine water-rights. At Florida the situation is much the same as at San Jacinto. In this part of the county many new orchards are being put out, and development of the industry is quite rapid.

The Winchester and Diamond Valley country, while being principally an agricultural section, has many fine orchards, and the production of fruit is quite heavy. The water-supply, while not sufficient for all the lands, is adequate for all the orchards now growing, and thrifty and well-kept trees is the invariable rule with the orchardists in this part of the county.

In what is known as the Murrietta Valley, the towns of Wildomar, Murrietta, and Temecula are situated. In this, the southern part of the county, horticulture has not been developed to the extent it has in other parts of the county, but enough has been done to demonstrate the fact that it is well adapted to fruit-growing. Considerable land in this part of the county is moist; in fact, very little irrigating of orchards is done, most of them being on moist land.

At Elsinore and the settlements around the lake of that name, there is quite a body of fine orchards, and a large amount of fruit is shipped from this point every season. Most of the orchards here are on moist land, as the water-supply for irrigation is not very great. About one thousand acres is devoted to horticulture at this point, and, were a reliable water-supply for irrigation provided, this acreage could be easily doubled.

We have briefly mentioned the districts where deciduous fruits are the principal horticultural industry. It is true, quite an acreage has been set to oranges in the Moreno and Alessandro Valley, and a few acres are planted at Perris and Elsinore, and about 150 acres at Florida,

making in all about 1,000 acres, outside of the Riverside Valley and Corona. We will now briefly refer to our citrus-growing districts.

Corona (South Riverside), the noted frostless belt, has been extending her acreage so rapidly that she will soon become a close competitor, as an orange-growing district, of the far-famed Riverside. She now leads all other sections in acreage planted to lemons, and with her ample water-supply, which is under complete control of the consumers, in addition to her superb location and her immunity from frost, she has other resources at hand to make her, not only a great fruit-growing center, but an important manufacturing center as well.

We have reserved the Riverside Valley for the last, in order to show the extensive horticultural development of our county outside of its greatest and best fruit-growing district. We will not attempt to add anything to the glory and fame of Riverside as an orange-producing center, or as a land of beauty and progress. This has been done by more eloquent pens than ours, but we would say that, in spite of the destructive frost of last winter, the severest ever known to visit us, the acreage set to citrus fruits in this valley has increased by about 300 acres the past season. The total shipment of oranges for the season amounted to 555,310 boxes, making 2,021 carloads. The crop for the coming season bids fair to come up to the average, despite the heavy falling of the young fruit and the loss from trees injured by last winter's frost.

The work of the Commission has been kept up by the present members to the high standard of efficiency established by our predecessors, and we feel confident that in no county in the State are more thorough quarantine and inspection regulations enforced, or injurious insects more promptly destroyed. The black scale, which has been troubling us considerably the past few years, has largely decreased, and at present, by many of our orchardists, is not considered a factor in their horticultural operations. However, we shall be prepared to combat this pest should it become damaging again. The fight against all other insect pests is being waged with the same thoroughness that has characterized our operations in the past, and is marked with a greater degree of success than ever.

It is noted that there is an apparent increase in the amount of gum disease observable in our groves, and we are devoting considerable attention to this matter, and hope to get the Department of Agriculture to detail an expert to study these matters, with a view to determining the nature of and treatment for these diseases.

GEORGE VAN KIRK,
FELIX G. HAVENS,
Commissioners.

RIVERSIDE, September 14, 1896.

SACRAMENTO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I herewith submit my report as Horticultural Commissioner of Sacramento County:

I have inspected every orchard in the county, and find most all of them more or less infested with pernicious scale. With but a few excep-

tions, every orchard in the county has been sprayed with lime, sulphur, and salt this year; the scale is very much on the decrease, and I think it will be but a little while, with proper treatment, before it will be entirely eradicated. I found some orange orchards infested with soft brown scale, and had them treated with whale-oil soap solution; also, some with yellow scale, which I had sprayed with resin wash.

I find pear aphid in some parts of the county, which proves to be a very serious pest, and very difficult to fight. L. D. Greene, of Walnut Grove, treated some trees on his place with common salt in 1895, and the trees so treated made a good growth, but it did not kill all the aphid. Mr. Greene applied the salt by first digging a ditch around the base of the tree, and used about four pounds of salt to each tree, and plenty of water. Codlin moth has not been so bad this year as in former years. Almost every orchard was sprayed with Paris green solution as a preventive against it.

I have distributed a number of *Vedalia cardinalis* where I found some orange and lemon trees infested with cottony-cushion scale, and they are doing good work.

On some shipments of deciduous trees into the county I found root knot; all trees thus affected were destroyed. On one small shipment of orange and lemon trees from Los Angeles County, were some live black scale; they were held and disinfected.

There were about 50,000 citrus and 70,000 deciduous trees planted in this county this season.

Respectfully submitted.

JOHN N. STEPHENSON,
Commissioner.

SACRAMENTO, September 16, 1896.

SAN BERNARDINO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In December, 1895, our Honorable Board of Supervisors, in the interests of economy and a desire expressed by the press and the late Grand Jury of our county, decided to reduce the Board of Horticultural Commissioners from three members to one, and in January, 1896, appointed S. A. Pease as sole Commissioner in and for San Bernardino County.

But the former Board of Horticultural Commissioners were advised by their attorneys that the action reducing the Commissioners was illegal, causing considerable inconvenience and annoyance to nurserymen and horticulturists. After an agitation of the subject for several months the matter was finally brought before the Superior Court, and in May, 1896, Judge George E. Otis decided that the law giving the Supervisors power to appoint a Commission of one man was unconstitutional, and if constitutional, only applied to counties where no Commission existed.

Therefore, nothing remained except for the Board of Commissioners to be increased to three members again. The present Board, as now constituted, consists of S. A. Pease, Chairman, W. J. Melville, Secretary, and H. B. Muscott.

In June we found the black scale (*Lecanium oleæ*) in several parts of

our county, causing considerable trouble; in the west end, mostly on olives, oranges, and lemons; in the east end, on apricot and ornamental stock. After a careful examination of the situation it was decided to give the *Rhizobius ventralis* a fair and impartial trial. To that end ten orchards were selected where the conditions seemed most favorable, and food plentiful—in Ontario, Cucamonga, Colton, Highlands, Messina, and Idlewild—our Board of Supervisors granting us power to make a contract whereby we could obtain 10,000 *Rhizobius* per month; and these were placed on the same trees in the orchards every two weeks in colonies of 500. Thus far those placed in Ontario and Cucamonga have given the best results, as there is more humidity in those localities than in the foothills of Highlands. But we shall have to wait a few months yet to determine the benefits derived from this little parasite.

We examined the orchards in July and August and found from 60% to 70% of the *Lecanium oleæ* to be dead, killed by the excessive heat, and the eggs dried up. The scale seemed to hatch out earlier this year than usual. We found the young live scale on the trees in the early part of July, but in August the young scale in many orchards were dead. The white scale (*Icerya purchasi*), which obtained such a foothold in the eastern part of our county over a year ago, has been almost exterminated by the *Vedalia cardinalis*, which in every instance has proved successful. At first the orchardists were alarmed, and in a few instances sprayed their trees, but after seeing what the little parasite could do they determined to allow it to clean their orchards of the pest.

Only a few cases of red scale (*Aspidiotus aurantii*) have been found in our county, and radical means were adopted to eradicate the same, viz., fumigation, which in every case has proved successful, and at the present writing we do not believe a single red scale exists in our county. In one case it was brought in on young trees from an adjoining county, and they were planted before our inspector had knowledge of it, showing how necessary it is for inspectors to be on the watch.

The San José scale (*Aspidiotus perniciosus*), which for the last four years has ceased to trouble us, owing to the thorough spraying with that never-failing wash, lime, sulphur, and salt solution, bids fair to return to a limited extent. But with the winter coming on, spraying will again be resorted to, as our orchardists have found their fruit clean and bright and commanding better prices than when their orchards were infested.

The red spider (*Tetranychus telarius*) we find prevalent upon almond, pear, prune, and plum trees, but not to any alarming extent.

We find root knot on almost every kind of deciduous stock, more particularly upon peach and apple roots. A great many theories have been advanced as to the cause of this disease, but so far we are no nearer the solution of the difficulty.

One of the greatest sources of danger to our county is the importance of ornamental stock from infested districts, and in the early part of this year plants have been quarantined and disinfected which otherwise would have infested the whole district. We have found *Aspidiotus nerii*, *Chionaspis aspidistræ*, *Aspidiotus camellix*, *Aspidiotus ficus*, *Diaspis boisduvalii*, *Aspidiotus aurantii*, *Lecanium oleæ*, *L. hesperidum*, *A. juglans-regia*, *Diaspis rosæ*, and *A. citrinus* on ornamental stock, *Anguillula* root-knot on persimmon, and woolly aphis (*Schizoneura lanigera*) on apple trees, thus showing the necessity of strict quarantine laws and systematic inspection. We believe a change in our postal laws would be a great

help to the Commissioners of the State, so that postmasters could inform the inspectors or quarantine guardians when buds, plants, or other stock sent by mail from outside of our State (and very often from infested districts) are shipped in, or even from within our own State. We have found buds sent from Florida with purple scale (*Mytilaspis citricola*), long scale (*Mytilaspis gloverii*), and chaff scale (*Parlatoria pergandii*), and if permitted to be taken into the orchards would in all probability have infested them.

The planting of citrus and deciduous stock has been much larger this year than last, the citrus planting being stimulated by the frost in Florida two years ago. Many thousands of orange trees have been sent to the northern part of our State, Arizona, and Florida. Our trees are in a healthy condition and doing well. Our crop of citrus fruits will be a little short, below the average, but with young orchards coming into bearing we can look forward to a very large increase next year. Peaches and apricots are also very light, and prices in most cases ruling low.

We have a corps of twelve inspectors, and our Board of Commissioners feels greatly encouraged with the result of its efforts to rid the orchards of the different pests. Knowing the importance of the fruit interests, which will yearly require more care and supervision, together with a judicious expenditure of the county funds, and having the hearty coöperation of the horticulturists, and the generous support of our Honorable Board of Supervisors, we feel sure our county can be kept in a healthy condition.

The above report was adopted at the regular meeting of the Board of Horticultural Commissioners, September 5, 1896.

Respectfully submitted.

W. J. MELVILLE,
Secretary.

SAN DIEGO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I have the honor to submit herewith the annual report of the Board of Horticultural Commissioners of San Diego County.

The county is divided into three horticultural districts: W. R. Gunnis, of San Diego, Chairman, for the First District; Chester Gunn, of Julian, for the Second, and F. Austin, of Escondido, Secretary, for the Third. We meet once in three months for the purpose of comparing our work, exchanging ideas, and for general discussion of our duties. The Commissioners have been active, and are pleased to state that the orchardists have complied with the law very generally. We have had no trouble to get them to treat their infested trees, and can say that beneficial results have followed. We have various scale pests to contend with, and find they yield readily to kerosene emulsion, providing it is applied at the right time, leaving no bad results on the fruit or trees. Large trees are generally fumigated with hydrocyanic gas. The scale is gradually disappearing, owing, we believe, to the extreme warm summer. We find comparatively few apples infested with codlin moth.

The *Rhizobius*, as a parasite for black scale, has not proved altogether successful in this county. We have placed a few colonies this season in

such orchards as we think suitable for their colonization, hoping they may become colonized and prove beneficial. We have many varieties of ladybirds in this county that feed on young scale, but their process is too slow as scale-destroyers. The most beneficial insect at present is the little chalcid fly, and we find evidence of its work in all parts of the county. In some cases 90% of the black scale have been destroyed by our little friend (*Delophogaster Californica*). We find that trees that have been pruned properly are less infested with scale than those that are allowed to go as nature directs them. Training them up, thinning out, thus better providing them with sunshine and air, is as beneficial as spraying. Our orchards that have the benefit of irrigation are all doing well, and are looking better than ever before. Growers work intelligently, trying to eradicate the scale pests, and success is being met with by those using kerosene emulsion. The die-back, or *Exanthema*, has found its way to this county. In some cases the disease is well developed on both Florida- and California-grown trees. Our treatment has been to cut off all infested parts. Others have taken out their infested trees. The disease appears generally under similar conditions of soil and poor drainage.

The oranges and lemons dropped their fruit during the early summer to such an extent that the crop promises to be less than last year. Our deciduous trees are yielding very light crops, owing to the condition of the spring season. Our trees started off in fine shape much earlier than usual; later the weather became cold and remained so for seventy days, thereby prolonging the blossoming season through a period of three months. Many of the prune trees were in full bloom the last of June, and at that time the hot weather destroyed the blossoms, and the result is, apples and pears will yield about 40% of a crop, apricots about 50%, prunes, peaches, and plums, 10%; except Japanese varieties of the plum, which blossomed before the cold weather struck us and matured nicely, with a fair yield. Our mountain districts are mostly devoted to apple culture, and the apples grown there are second to none, and the industry is gradually growing and is thought to be very profitable. Nearly all deciduous fruit trees thrive and produce the highest grade of fruit. In the mountain districts the red spider has been quite prevalent this season. It appears to yield to a treatment of sulphur, which may be blown or sifted on young trees, and can be applied to large trees by means of a seed-sower.* Spraying with cold water under high pressure will destroy them. The nursery trees came into this county generally in good condition. Out of more than 100,000 nursery trees, one consignment of lemon trees was found infested with *Mytilaspis citricola*, and they were condemned and burned. One consignment of orange trees was found to be infested with *Lecanium oleæ*; these were dipped in kerosene emulsion.

Mr. W. R. Gunnis estimates that the lemon plant in his district the past two years has been 25% of an increase, or 108,000 trees, and 6,150 orange trees, with an increase of about 10% in olives and deciduous trees.

The following table gives the tree plant in the Third District for the year 1896:

Oranges.....	5,296
Lemons.....	20,200
Olives.....	30,893
Deciduous.....	52,587
Total	108,986

* Shown for the first time in Report of State Board of Horticulture, 1893-94.

The following table gives the trees and vines that have been inspected in the county. A large per cent of the trees in the Third District have not been inspected. This table does not include the plant of 1896:

Variety.	Number.	In Bearing.
Oranges	210,441	40%
Lemons	553,131	20
Apples	113,407	50
Apricots	80,913	70
Cherries	4,284	30
Figs	34,225	85
Nuts	51,493	20
Olives	154,885	16
Pears	40,992	50
Peaches	197,526	60
Prunes	160,817	40
Miscellaneous	4,342	60
Vines	2,019,877	96
Nursery stock	287,000	--
Seed-bed	2,225	--

The exportation of oranges and lemons the past year is as follows:

Oranges	40,330 boxes
Lemons	53,830 boxes

Respectfully submitted.

F. AUSTIN,
Secretary.

ESCONDIDO, September 20, 1896.

SAN JOAQUIN COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: Herewith find my report as the Horticultural Commissioner for San Joaquin County.

San Joaquin County, situated as it is with its water and rail facilities and its great fertility of soil, is rapidly coming to the front as a fruit-producing county. Farmers who have been raising wheat at a price below the cost of production are beginning to see the advantages gained by having orchards and vineyards when their grain crops are not satisfactory. In 1895 the grain crop was short and prices low, while all the orchards and vineyards had good crops, which sold readily at good prices. This condition of affairs opened the eyes of the farmer, and now we find young orchards and vineyards where formerly grain was growing. Over 600 acres were planted during the winter of 1895-96, and a still greater acreage is to be planted during the coming season.

Of all trees in this county the almond heads the list with 1,431 acres. The largest almond orchard in the county is that of P. B. Armstrong, of Acampo, who owns 480 acres in one body, which is said to be the largest almond orchard in the world. This year, with only half a crop, he will get 200 tons of choice almonds, which will no doubt sell for 12 cents a pound, bringing in a revenue of \$100 per acre. This shows that an almond orchard in this county is a most valuable investment, as the

crop has never failed except in case of a frost, such as occurred this year, something which happens only once in about thirteen years.

The almond crop is now being harvested and gives employment to many people, there being fully four hundred people employed in the Langford colony alone. Women and children are mainly employed in curing the nuts, and they make from 85 cents to \$1 50 per day, according to their ability.

Plums and prunes in great variety are grown in this county, fully 1,185 acres being planted with them. The varieties embrace all the leading kinds, including the Burbank, Somoni, Splendor, Abundance, and Tragedy, most of which are of Japanese origin, and are noted for their elegance and good shipping qualities. The bulk of the plum and prune crop is shipped East in a green state. Prices having been unusually good this season in all the Eastern markets, the growers find it pays them better to make this disposition of their prunes than to dry them.

Our soil is peculiarly adapted to plums and prunes, and I look for a large increase in the plum and prune industry in the near future.

Peaches rank next on the list, there being 959 acres devoted to the cultivation of this fruit alone, the largest holding being that of Senator B. F. Langford, who has 400 acres in one tract. Fully 75% of the peach crop is either shipped green to the Eastern markets, or is dried. The balance is sold locally and to the canneries in San Francisco. Prices this year ranged from \$12 50 to \$20 50 a ton for freestones, and from \$17 50 to \$27 50 for clings, there being an unusual demand for choice clings of all varieties not red at the pit. The peach has proved one of the most profitable fruits grown in this county. It bears at an early age, and a failure of the crop is unknown.

Apricots, too, are extensively raised here, fully 870 acres being in this fruit. The tree, as a rule, is remarkably thrifty and long lived, and is usually a very heavy bearer. All the leading varieties are grown here, such as the Blenheim, Moorpark, Royal Peach, and the New French, which was propagated by a local nurseryman. Fully 90% of the fruit is either dried or sold to canneries, the balance going to the Eastern markets.

In pears there are 299 acres planted, the Bartlett being the principal variety. All pears thrive on the heavier soils, and generally bring the grower handsome returns. Very little of this fruit is dried, nearly all being shipped to outside points.

The apple, strange to say, has been sadly neglected, there being only 51 acres of this fruit. It grows remarkably well, but needs constant care to preserve good fruit. A fortune awaits the grower who will plant a good apple orchard, as there is a good local market at all seasons of the year, and Stockton's rail connections with all markets, Eastern and Californian, make apple-raising a safe and sure investment.

Other fruits, such as olives, oranges, figs, cherries, etc., are grown to some extent, and come in for their full share of attention on the part of the orchardists. Grapes are planted more extensively than any other class of fruit, and there are over 2,500 acres in vineyards in the county. Here are raised all varieties of wine and table grapes, and the quality and quantity are all that could be desired. On the heavy, black lands in the vicinity of Stockton are grown the heavy wine grapes, and the justly celebrated Black Prince, or Rose of Peru. This variety, as grown

here, has established a reputation for itself all over the Middle-Western and Southern States, and is as famous as the oranges from Riverside. On the lighter soil, such as is found between Stockton and Lodi, the wonderful Tokay flourishes, and has given San Joaquin County a name in all the large cities in the United States. It is shipped exclusively to these larger markets, where it always brings fancy prices. The Muscat of Alexandria, which is grown in other parts of the State as a raisin grape, grows to such perfection that it is raised altogether as a shipping grape here. Its carrying qualities are such that it is greatly sought after, and the demand generally exceeds the supply. The wine vineyards are scattered all over the county, and are not confined to any particular locality. Many of the largest vineyards are in the neighborhood of Lodi and Woodbridge, and on the redlands east of Stockton. The wine industry here has assumed such proportions that San Joaquin County boasts one of the largest wineries and distilleries in the State. Vineyardists, in consequence, find a ready market for all wine grapes here at home at good prices. This winery is owned by George West & Son, and has a world-wide reputation for the wines and brandies made from the products of the vineyards of San Joaquin County.

Following is a statement of the acreage in trees and vines planted in this county:

Variety.	Bearing.	Not Bearing.	Total.
Apples	34	17	51
Apricots	656	214	870
Cherries	71	74	145
Figs	89	20	109
Olives	51	97	148
Peaches	755	204	959
Pears	242	57	299
Plums and prunes	795	390	1,185
Lemons	3	3	6
Oranges	16	25	41
Almonds	848	547	1,431
Walnuts	22	11	33
Small fruits	550		550
Wine grapes	394	165	559
Table grapes	749	385	1,134
Raisin grapes	518	198	716
Totals	5,829	2,407	8,236

In addition to the above, I would respectfully state that as far as insect pests are concerned, more attention has been given them than in former years. Our present Board of Supervisors, knowing the acreage of and interest taken in our trees and vines, have deemed it expedient to appoint one Commissioner, whose duty it shall be to devote his whole time, if necessary, to promote and protect the horticultural interests of this county. Our greatest enemy is the codlin moth, which I find very difficult to overcome, notwithstanding nearly every fruit-grower sprays for this one pest. What little black and cottony-cushion scale we have is rapidly disappearing, thanks to the State Board, who have so kindly furnished us with the ladybirds. Our fruit-growers are, as a rule, a very intelligent class, and have coöperated with me to rid the county of what pests we have.

Respectfully submitted.

A. W. YOUNG,
Commissioner.

STOCKTON, 1896.

SAN MATEO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I herewith submit my report for the past season, or for that portion of it in which I have served as Horticultural Commissioner of San Mateo County.

I received my appointment to this position in February, 1896, prior to which time, for several years, there had been no Board of Horticultural Commissioners. As a result, this was an open county, and became very largely a dumping-ground for refuse nursery stock from all parts of the State. The natural sequence to this state of affairs was that, with the unrestricted introduction of outside pests and the neglected condition of many orchards and grounds within the county, this county was very badly overrun with all the pests common to the State. *Lecanium oleæ* is especially prevalent, and is a serious drawback in our olive orchards. *Lecanium hesperidum* and *Lecanium hemisphæricum* are also prevalent, but not so common as *oleæ*. Of other scale insects, *Mytilaspis pomorum* is common in our apple orchards, while most of the California varieties exist to some extent. The codlin moth is the worst pest with which we are troubled, and there are few apple or pear orchards in the county in which it does not exist.

My chief efforts last spring were directed against the black scale and the codlin moth, as the two worst pests of our orchards. It was late in the season before I could get to work, but I am pleased to report that good results have followed my labors. I succeeded in having many of the orchards sprayed for both pests, and found our fruit-growers and property owners generally willing to second my efforts in this direction; and, while there is still much to be done and more to be wished for, our fruit is much cleaner and freer from pests this year than for many years past.

Many of our orchardists have introduced parasites to combat the pests, and these, as a rule, are doing good work. The *Vedalia*, especially, I have found widely distributed in the county. So much so that I have, wherever I have found the white scale, advised the leaving of it to nature's remedy.

Since my incumbency I have instituted a strict quarantine on all imported nursery stock and plants, and nothing is now allowed to enter the county until inspected, and passed as clean. On this account the late shipments of the season were much cleaner than the earlier ones, and most were accompanied with an inspector's certificate.

With regard to the condition of fruit, it may be reported as spotted. In some sections of the county it has turned out well, in others poorly. Averaging the county, pears and apples have been a fair crop, apricots medium, cherries short, prunes about half a crop, peaches very light, other fruits fair to medium. Taking all classes together, we have had about two thirds of a crop this season.

The area of new fruit planted this year has been small, and but little new land will be put into fruit the coming season. The older orchards, however, will be better cared for, as there is a general disposition on the part of owners to clean up and put their places in shape, provided they are assured that their neighbors will not be allowed to breed pests to their detriment.

Respectfully submitted.

JOHN ISAAC,
Commissioner.

REDWOOD CITY, September 17, 1896.

SANTA BARBARA COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: We have the honor to submit herewith our annual report of the condition of the fruit interests, and what has been done to eradicate insect pests in Santa Barbara County for the year ending September 30, 1896.

Owing to the lack of the usual amount of rain during the last three years, all fruit trees not favored with irrigation have suffered to some extent. In early spring there was a warm spell of about ten days, which started the buds prematurely, and the "cold wave," accompanied in many localities by repeated hard frosts, which followed a few weeks later, destroyed the fruit buds, blossoms, and young fruit to a great degree, so that throughout the county there is, on an average, probably less than half a crop of deciduous fruits, the quality of which is, perhaps, fully equal to that of former years. Some varieties, as apricots, prunes, peaches, and nectarines, have been almost a failure; and while the apple in a few favored places has yielded well and the fruit been of good quality, yet, on an average, it has not produced more than half a crop. The northern portion of the county suffered most from the frosts and severe winds, the grape crop in the Santa Maria Valley being placed at one eighth the usual amount, while in the eastern portion of the county the grape crop is abundant and of excellent quality, and no disease of the vine has been observed. In the same district, Commissioner James Huston reports that a few isolated cases of San José scale yielded to coal oil treatment without injury to the trees; that the fruit industry is in a favorable condition as regards pests; that the *Rhizobii*, colonized there in 1894 and 1895, have mastered the black scale, and the orchards are looking well, especially the olive. The cottony-cushion scale made its appearance, but a colony of *Novius Koebelei* completely exterminated it.

Commissioner C. D. Dorris reports that in the Lompoc district the San José scale has been very destructive in the past, causing the loss of a great many trees; but thanks to our "little Australian friends" (the *Rhizobiids*), that pest seems to be fast disappearing. The "shot-hole fungus" made its appearance again in this district, but with less damage than last year. The "pear-slug" seems to be on the increase there, and measures will be carried out to exterminate it. In general, the orchards in that region are in better condition than for several years.

In the first district the pests have been on the decrease. Strict watch has been kept upon all importations of nursery stock at all the depots, and where necessary, disinfection has been required. The condition of deciduous trees shows little appearance of woolly aphis, and a decrease of the codlin moth, compared with past seasons. The olive orchards and orange groves are well nigh freed of black scale, and the same is true of most of the lemon ranches. A few growers have kept up voluntary spraying, but most of them are relying upon the *Rhizobiids* to keep the black scale in subjection. These enemies of the black scale have done their work so thoroughly that, although they are now to be found only in scattered numbers, this fact may be attributed rather to the absence of scale and the consequent scarcity of food than otherwise.

The lemon industry of this district has increased to such proportions

that an exchange for curing, shipping, and marketing the fruit has been established this season, with gratifying prospects. Lemon orchards of ten acres from three to five years old are now yielding from two to six tons of fruit per month, and the crop will probably double next season. Through the medium of the exchange better prices for the fruit will doubtless be realized.

So far as we can judge there has been no disease upon the walnut; the crop promises fair in quantity, but the nuts will average a little under size. The olive has a good showing, and the prospect is fair for the usual crop. For several reasons, chief among which is the decreased annual rainfall, there has been a far less acreage planted to trees this year than during either of the last two years.

Respectfully submitted.

T. N. SNOW,
Secretary.

SANTA BARBARA, September 22, 1896.

[SANTA CLARA COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I have the honor to submit for your kind consideration my annual report as Horticultural Commissioner of Santa Clara County.

I received my appointment in December, 1895, and at first was given a four months' term, at the end of which time some of our leading fruit-growers petitioned the Supervisors, asking that a permanent Commissioner be appointed, as the interests were so great as to demand that some one should always be at hand to consult on the different subjects of horticulture. This has been done.

This county has largely added to its acreage of orchards and vineyards in the last few years, and a rough estimate of the acreage of different fruits is as follows:

Variety.	Bearing.	Not Bearing.
Apples.....	252	48
Apricots.....	3,705	1,292
Cherries.....	835	640
Prunes.....	14,937	13,417
Plums.....	353	75
Peaches.....	3,109	1,824
Pears.....	936	387
Quinces.....	12	2
Olives.....	75	84
Oranges and lemons.....	9	22
Figs.....	12	8
Almonds.....	160	65
Walnuts.....	63	45
Berries.....	400	-----

Total area in fruit 42,767 acres.

The crops of 1896 can be put as follows: Apples a medium crop, apricots very short, cherries very short, peaches good crop, pears good crop, prunes about a third of a crop. It is too soon to make an estimate of the tonnage of fruits produced, as a great deal of fruit is being dried and very little of it has been sold up to date.

A very large industry here is seed-farming, and over 2,000 acres are annually planted, onions and lettuce being mostly raised, but other vegetables and flower seeds also, in limited quantities.

During planting season there were sent into this county the following nursery stocks:

Deciduous trees.....	91,513
Citrus.....	500
Rooted grapevines.....	2,100
Ornamentals.....	2,675

From the State of Oregon, 14,075 deciduous trees and 3,300 berry plants, and from France and the Eastern States, 85,000 seedlings for nursery stock.

All the apple and pear stocks were dipped. One shipment, direct from Japan, contained 810 ornamentals, and all these were fumigated.

There are four insects in particular which trouble us in this county, and I mention the peach-root borer (*Sannina pacifica*) as the most troublesome. This pest has spread into several new districts and has caused a great deal of annoyance to growers. During this season it has been fought vigorously, and I believe will give less trouble in the future. The best remedy is pine tar diluted with fish oil, two parts to one, and applied below ground on the trunk, and a thick whitewash put on the trunk above ground. Wherever this has been tried good results have been obtained.

A green vine-hopper (*Tettigonia circellata*) is causing a great deal of trouble in the vineyards. Being a sucking insect, it is hard to fight. Good results have been obtained by trapping. This is accomplished with a canvas bag in the morning when the insects are still numb. To illustrate the efficiency of the trap, I have known of instances where 30 pounds of insects have been captured in a day; and when we consider that 13 hoppers weigh 2 grains, or about 43,500 to the pound, the capture very soon runs into the millions. Where these insects are abundant the leaves of the vines have a curled and dwarfed appearance. The traps can only be used as long as the vine runners are short, and during this time trapping must be kept up. To make a bag, two yards of light canvas, one yard wide, are used. Two sides are left open, and on the edges of one side, two thirds the length, a lath is nailed.

The black scale (*Lecanium oleæ*) is still a pest in our deciduous orchards, infesting the prune, apricot, and peach trees. I find that the *Rhizobius ventralis* has done a great deal in eradicating this pest in olive orchards, and although I find some decrease in deciduous orchards, and find the ladybirds present in small numbers and in all stages, yet it seems there is something preventing the insect from freeing the trees of the scale.

A few vineyards have been attacked by the phylloxera, and wherever found the vines have been pulled up.

Among the periodical insects we have the cankerworm, for which we now use the wire-mesh tray very successfully, especially when the grower has attended to the details.

The Hessian fly was not as bad as last year, but wherever infested seed was planted the field did not produce a crop.

Pear blight troubles us only in moist localities. The root knot is not as plentiful as a few years ago. All infested young trees are thrown out in the nursery.

Through the kindness of Prof. J. B. Smith, of the New Jersey Experiment Station, I received five colonies of *Coccinella 9-notata*, a ladybird which is a very promising aphid-eater. These colonies have been liberated in this county, and I expect good results from them. In turn I have sent colonies of our *Comys fusca*, parasite of the apricot scale (*Lecanium armeniicum*), to New York, Canada, and New Jersey, to breed on the New York plum scale (*Lecanium juglandis*).

Respectfully submitted.

ED. M. EHRHORN,
Commissioner.

SAN JOSÉ, September 12, 1896.

STANISLAUS COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: During the year ending September 1, 1896, I have visited nearly all the orchards in Stanislaus County, and find that the infested orchards which were sprayed have been greatly improved, and that the *Vedalia cardinalis* has almost eradicated the cottony-cushion scale, which was very plentiful in the orchards and yards of Modesto.

The fruit industry is gradually increasing, there having been several thousand trees and vines planted this year.

Of the shipments of trees and plants which came into this county this season, all were free of pests but two, one of which was destroyed by burning; and the other was disinfected and rendered free from insects.

The fruit crop was small, about one half the usual amount. Apricots, grapes, berries, and peaches were scarce, but the pear and apple crops were large. Oranges and lemons are almost a failure.

I find it very up-hill work to fight the codlin moth, and there seems to be little, if anything, done in that line in our neighboring counties.

I have found it very necessary to keep a close watch on all citrus fruits coming from commission houses in San Francisco, Stockton, and Sacramento, as they were continually shipping into our county, from the southern part of the State, fruit badly infested with "red scale," a species which we have the good fortune to be without.

The nurserymen of this county are very cautious about allowing any pests or insects in their nurseries. I inspect all of them before allowing any nursery stock to be removed from them during planting season.

Respectfully submitted.

A. L. RUTHERFORD,
Commissioner.

MODESTO, September 1, 1896.

TEHAMA COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: We herewith present to you our annual report as County Horticultural Commissioners of Tehama County.

During the past twelve months we have visited many of the orchards in this county, and especially those in localities where the trees were known to be infested with pests. Through the labors of the Horticultural Commissioners and the mutual aid of the orchardists, good results have been effected in eradicating the San José scale, which at one time threatened to destroy the fruit interests of the county. We find that the sulphur, lime, and salt mixture has proven sufficient to destroy all scale; frequently one thorough spraying with this remedy has left the trees clean and free from scale, but we recommend a second application a year later. When sufficiently diluted as to not injure the foliage, we have used this remedy successfully as a summer wash.

We cannot be too careful in protecting our orchards against that dread disease known as "yellows," which exists in many of the Eastern States, and all peach trees or stock grown on peach roots, grafts, and buds from where this disease is known or liable to be, should be excluded from our State.

The root knot is becoming quite a serious trouble, especially to almond trees planted on heavy soils, the greatest loss being in bearing trees, as this Commission has by stringent quarantine regulations deterred shipments into this county of poor or diseased trees. Horticultural Commissioners of other counties are generally very careful in inspecting nursery stock, judging from the clean and healthy trees received by our orchardists last season, yet we request nurserymen to inspect their stock still more carefully and send out only good trees for planting, for upon them the fruit-growers must depend for future profits.

The codlin and peach moths have done some injury. The Muir peach seems to have been attacked by the moth more than any other variety. The red spider and yellow mite have damaged the almond and prune to some extent.

The fruit crop of Tehama County, owing to the late cold spring and long warm summer, has been greatly damaged; the amount, in our opinion, after a careful estimate, will not reach one fourth of a crop, and the fruit is generally of small size and inferior quality.

This county embraces some of the finest fruit soils in the State. The soils are alluvial and volcanic. The altitude and climate are such that both citrus and deciduous fruits can be produced in abundance and to perfection. Apples, pears, prunes, and peaches grown in our mountain and foothill districts are equal if not superior to those grown in the Eastern States, while in the valleys the orange and lemon thrive side by side with all of the hardier trees. The water-supply is sufficient to irrigate all the valuable land wherever needed. Although prices have been low during the past two or three seasons, our fruit-growers are not discouraged and planted largely last year, and contemplate doing the same the coming year.

Respectfully submitted.

EZRA CROTZER,
Commissioner.

RED BLUFF, September 19, 1896.

VENTURA COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: The County Board of Horticultural Commissioners of Ventura County respectfully submit their annual report.

The citrus fruit interests are in excellent condition, we would say perfect condition, were it not for the fact that black scale is getting into the young orchards in Sespe, Fillmore, Bardsdale, and Nordhoff. The ladybird (*Rhizobius ventralis*) has been liberated in these orchards repeatedly, but the climate seems to be too hot for them, for they do not increase. Near the coast this ladybird cleans citrus and olive trees from black scale, and is cleaning the hemispherical scale from the pepper trees. The large orange orchard at Santa Paula, owned by N. W. Blanchard, was never so clean before, and the cleaning has been done by the twice-stabbed ladybird, the black ladybird, the chalcid fly, and the lace-wing fly. All of the red, purple, and other bad scales have been exterminated by burning as soon as found, and this policy will probably be kept up as long as a Commission exists in the county. What has been said of black scale on citrus trees applies also to olive trees: the *Rhizobius* is cleaning the orchards near the coast, but not at Nordhoff and Sespe. The farthest orchard from the coast in which they have done good work is at Santa Paula, sixteen miles.

The deciduous fruit interests are in better condition than they ever were before, being troubled with but one pest, the codlin moth, which is slowly spreading. The pernicious scale was introduced before a Commission was appointed, and obtained a strong foothold in many orchards, but it has been reduced to very small proportions by the use of the lime, salt, and sulphur wash. No new pests have been discovered. We still have a local inspector at each depot to inspect all trees coming into the county, but have not ordered a general inspection of the orchards this year, because we knew that no scale could get much of a start in one year, and wished to avoid all unnecessary expense.

W. I. RICE, President,
J. F. McINTYRE, Secretary,
T. A. RICE,
Commissioners.

VENTURA, September 12, 1896.

YUBA COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I herewith present to the State Board of Horticulture the report of the Horticultural Commissioner of Yuba County for the term ending October 1, 1896.

The horticultural interests of Yuba County are in a fairly thrifty condition. During the past year the work of the Horticultural Commissioner's office has been somewhat restricted, owing to a scaling down of expenses by the Board of Supervisors. As far as it was possible, however, a careful watch was kept on the various fruit-growing districts

of the county for the purpose of ascertaining the condition of insect pests.

The commercial groves in the valley part of the county, both deciduous and citrus, are practically free from the devastating species of injurious insects.

In the Wheatland district, which is rapidly becoming a very important horticultural center, fruit trees are remarkably free from injurious insect pests, and in very thrifty shape. The San José scale, which at one time had gained a footing there, has disappeared, owing to the careful spraying of the trees by the growers.

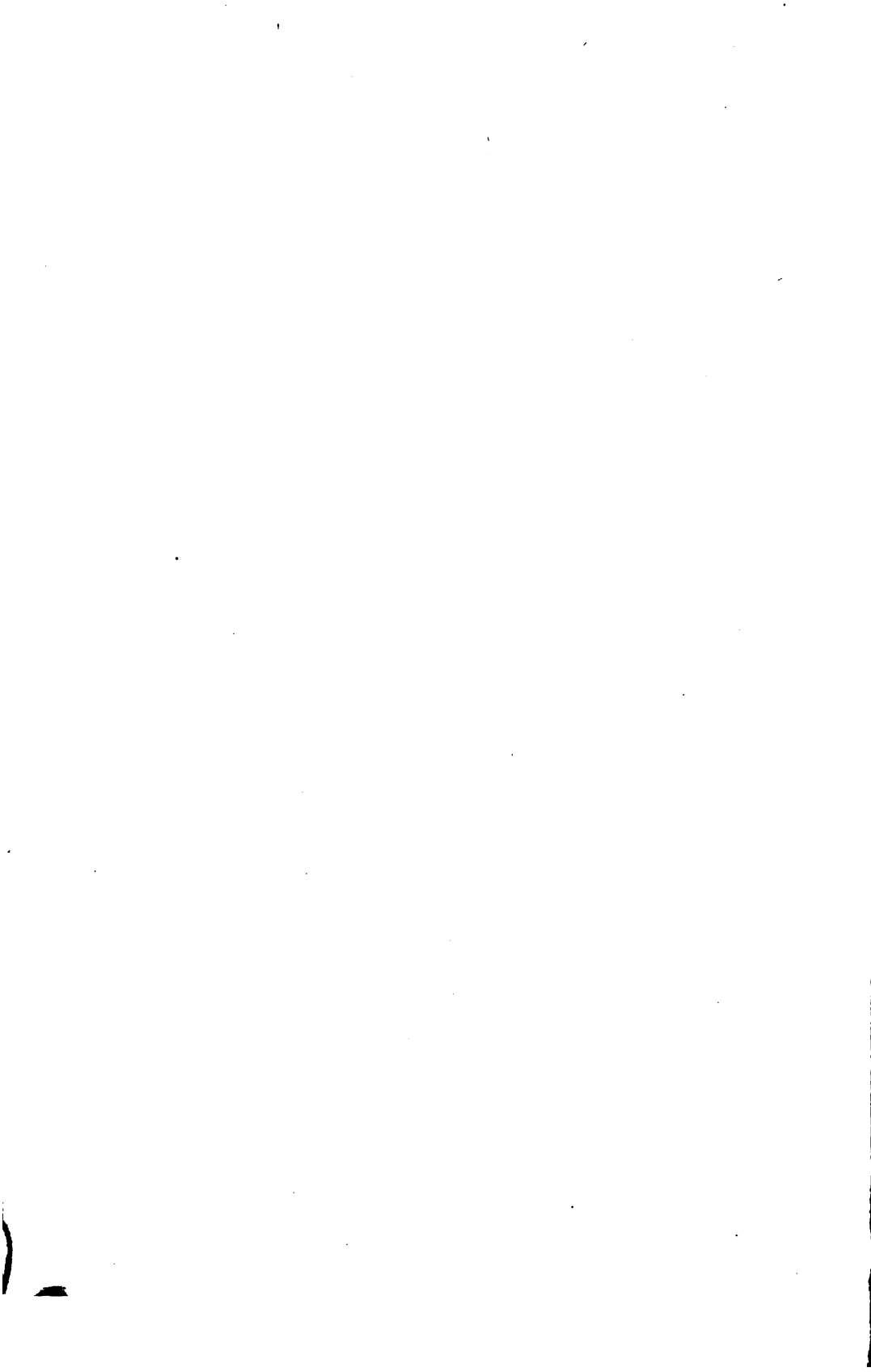
In the apple-growing regions in the mountainous part of the county no inspections were made during the past year, owing to the restrictions on expenses of this office. Reports from those districts, however, would indicate that the San José scale was not so numerous as formerly, but that the codlin moth was still a very serious pest. A bulletin on the subject of the codlin moth was prepared and sent out from this office, giving full information as to the habits and life-history of this insect, together with an account of the best remedies to use for its suppression. On account of a very short apple crop this year, occasioned by frosts, it was not possible to learn whether or not there had been a decrease in the codlin moth pest.

The citrus trees in the City of Marysville are still infested with the yellow scale. Early in the year it was observed that the scale had decreased in numbers to a very large extent; the scale appeared to be rapidly disappearing, which fact was attributed to the work of the chalcid fly, which had been successfully introduced here. As the season advanced, and especially during the latter part of the summer, the scale seemed to commence to multiply again, although the chalcid flies were present in large numbers. At the present time the infested trees are under careful observation, and it may be possible to determine, later in the year, whether the chalcid flies are to have any permanent effect on the scale or not.

Respectfully submitted.

G. W. HARNEY,
Commissioner.

MARYSVILLE, October 1, 1896.



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